CLIENTS | PEOPLE | PERFORMANCE

North Mining Limited

Northparkes Mines

Section 75W Environmental Assessment

March 2009

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Figure Index

Appendices

Submission of Environmental Assessment

Prepared under the Environmental Planning and Assessment Act 1979, Section 75W

Environmental assessment prepared by:	
Name	David Chubb
Qualifications	Bachelor of Science (Hons) Masters of Applied Science (Environmental Management)
Address	GHD Pty Ltd 10 Bond Street Sydney NSW 2000
In respect of:	
Project to which Part 3A applies	
Applicant name	North Mining Limited
Applicant address	PO Box 995 PARKES NSW 2870
Land to be developed	Bogan Road, GOONUMBLA NSW 2870
Land description	Lots 1, 2 in DP 830291; Lots 12, 14, 46, 49 in DP 753998; Lot 3 in DP 831119; Lot 1 in DP 831662; Lot 43 in DP 1120299; Lot 382 in DP 1108642; Lot 41 in DP 753998; Lot 41 in DP 1120299; and Various closed roads.

Proposed development	The proposed modifications to the existing consent considered in this environmental assessment are: ◗ Construction of a new tailings storage facility "Estcourt" TSF including any associated floor preparation and drainage system; ◗ Increase the limit on approval to 8.5 million tonnes of ore processed per year; ◗ Extend the life of the mine through to 2025; ◗ Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations; and ◗ Upgrades and modifications to existing processing infrastructure including: – Module 1 and 2 Grinding Circuits; – Module 1 and 2 Flotation Circuits; – Module 3 Flotation Circuit; – Concentrate Handling Facilities; and – Tailings Handling Facilities.
Environmental assessment	An environmental assessment is attached
Certificate	I certify that I have prepared the contents of this document and to the best of my knowledge: It is in accordance with the requirements of Part 3A; It contains all available information that is relevant to the environmental assessment of the development to which it relates; and The information contained in the document is neither false nor misleading.
Signature	
Name	David Chubb
Date	31 March 2009

Glossary of terms

Acoustic	Pertaining to the sense of organs of hearing, or to the science of sound.
Bund	An impervious embankment of earth or a brick wall, which may form part or all of the perimeter of a compound that is provided to retain liquid.
Consent	Approval to undertake a development received from the consent authority.
Director-General's requirements	Requirements for an environmental assessment issued by the Director-General of the NSW Department of Planning in accordance with the *Environment Planning and Assessment Act 1979*.
Emission	The release of material into the surroundings (for example, gas, noise, water).
Environmental management plan	A document setting out the management, control and monitoring measures to be implemented during construction and/or operation of a development, to avoid or minimise the potential environmental impacts identified during an environmental impact assessment process.
Geotechnical	Relating to the form, arrangement and structure of geology, soils etc.
Hydrology	Term given to the study of the rainfall and runoff process.
Key threatening process	A process specified in Schedule 3 of the *Threatened Species Conservation Act 1995* that adversely affects threatened species, populations or ecological communities, or could cause those that are not threatened to become so.
Particulate	Small particles, usually occurring in suspension.
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 of the *Threatened Species Conservation Act 1995*.

List of abbreviations

AEMR	Annual Environmental Management Report
AHD	Australian height datum
AHMP	Aboriginal Heritage Management Plan
AHWG	Aboriginal Heritage Working Group
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
CIP	Carbon-In-Pulp
CoRTN	Calculation of Road Traffic Noise
DA	Development Application
dB	Decibels
dBA	Decibels (A–weighted)
DECC	Department of Environment and Climate Change (NSW)
DEWHA	Department of Environment, Water, Heritage and the Arts
DGR	Director General's Requirements or Director General's Environmental Assessment Requirements
DLWC	Department of Land and Water Conservation (NSW) (Now Department of Water and Energy)
DoP	Department of Planning
DP	Deposited Plan
DPI	Department of Primary Industries (NSW)
DPI (MR)	Department of Primary Industries (Mineral Resources) (NSW)
DUAP	Department of Urban Affairs and Planning (Now Department of Planning)
DWE	Department of Water and Energy
EA	Environmental Assessment
EC	Electrical Conductivity
ECRTN	Environmental Criteria for Road Traffic Noise
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement

ENCM	Environmental Noise Control Manual
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environment Protection Licence
GHD	GHD Pty Ltd
HEC-RAS	Hydrologic Engineering Centres - River Analysis System
HSE	Health Safety and Environment
HVAS	High Volume Air Samplers
INP	Industrial Noise Policy
LGA	Local government area
MIBC	Methyl Isobutyl Carbinol
ML	Megalitre
MOP	Mining Operations Plan
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NES	National Environment Significance
NO_2	Nitrogen Dioxide
NO_x	Nitrogen oxides
NPI	National Pollutant Inventory
NPM	Northparkes Mines
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NPWS	National Parks and Wildlife Service (NSW)
OEMP	Operational Environment Management Plan
OH&S	Occupation Health and Safety
PM_{10}	Particulate Matter measuring 10 micrometers or less
$PM_{2.5}$	Particulate Matter measuring 2.5 micrometers or less
POEO Act	Protection of the Environment Operations Act 1997
PSC	Parkes Shire Council
PVS	Peak Vector Sum
RBL	Rating Background Level

RL	Reduced level
ROM	Run-of-Mine
RP	Retention Pond
RTA	Roads and Traffic Authority
RWD	Return Water Dam
SAG	Semi-Autogenous Grinding (Mill)
SCL	Southern Cross Landowners
SEC	Statement of Environmental Commitments
SEPP	State environmental planning policy
SLM	Sound level meter
SMU	Soil Mapping Unit
SO_2	Sulphur dioxide
SWMP	Surface Water Management Plan
TAPM	The Air Pollution Model
TDS	Total Dissolved Solids
TSC Act	Threatened Species Conservation Act 1995
TSF	Tailings Storage Facility
TSP	Total Suspended Particulate
TWS	Town Water Supply
UHF	Ultra High Frequency
VCA	Voluntary Conservation Agreement
VHF	Very High Frequency
vpd	Vehicles per day
vph	Vehicles per hour
WMA	Water Management Act 2000
WSP	Water Sharing Plan

Glossary of symbols

$M	million dollars
%	percentage
%HV	Percentage of Heavy Vehicles
~	Approximately equal to
<	less than
>	greater than
≤	less than or equal to
≥	greater than or equal to
°	degrees
°C	degrees Celsius
$\mu g/m^3$	micrograms (1×10^{-6} grams) per cubic metre
µm	micrometres (= 0.001 mm)
µS/cm	microsiemens per centimetre – unit of electrical conductivity
bcm	bank cubic metre – a volume of $1m^3$ in the ground prior to disturbance
cm	centimetre (= 10 mm)
D%	Dispersion Percentage
dB	decibel, unit used to express sound intensity
dB(A)	the unit of measurement of sound pressure level heard by the human ear, expressed in “A” scale
deg	degrees
g	gram (= 0.001 kilogram)
$g/m^2/month$	grams per square metre per month – unit for deposited dust
g/t	grams per tonne
ha	hectare (100m x 100m)
hr	hour
kg	kilogram (= 1 000 grams)
kL	kilolitre (= 1 000 litres)
km	kilometre (= 1 000 metres)
km/h	kilometres per hour

km^2	square kilometre (= 1 million m2)
kV	kilovolts
kVA	kilowatt – amperes
kW	kilowatts
L	litre
L/hr	litres per hour
L/s	litres per second
L/t	litres per tonne
L_{a10}	sound level exceeded 10% of the sampling time
L_{a90}	sound level exceeded 90% of the sampling time
L_{Aeq}	the L_{Aeq} is the "equal energy" average noise levels, and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures
$L_{Aeq\ 1\ hour}$	the "equal energy" average noise level over 60 minutes – used for assessing impacts of noise from motor vehicles on public roads
$L_{Aeq\ T}$	sound level of continuous noise which emits the same energy as the fluctuating sound over a given time period (T)
L_{Amax}	the absolute maximum noise level measured in a given time interval
$L_{Amin\ (Period)}$	The minimum sound level recorded during a specified time interval
L_{AN}	the A-weighted sound pressure level exceeded by N% of a given measured period
lcm	loose cubic metre – a volume of 1m3 after excavation
L_N	Statistical sound measurement recorded on the linear scale.
M	metre (= 100 cm)
M	million
m AHD	metres Australian Height Datum
m/s	metres per second
m^2	square metre
m^3	cubic metre
Mbcm	million bank cubic metres
mg	milligram (weight unit = 0.001 gram)
mg/L	milligrams per litre (parts per million)
ML	megalitre

ML/day	megalitres per day
MLpa	megalitres per annum
mm	millimetre (= 0.001 metres)
mm/sec	millimetres per second
Mt	million tonnes (metric tonne = 1,000 kg)
Mtpa	million tonnes per annum
PM_{10}	particulate matter <10 µm in diameter
$PM_{2.5}$	particulate matter <2.5 µm in diameter
SWL	standing water level
t	tonne (= 1,000 kg)
t/hr	tonnes per hour
tpa	tonnes per annum
veh/hr	Vehicles per hour

Executive Summary

Overview

This Environmental Assessment presents the findings of work undertaken to support an application by North Mining Limited for a modification to their existing consent to operate Northparkes Mines.

Existing Operations

North Mining Limited operates Northparkes Mines (NPM), a copper-gold mining and processing operation, 27 kilometres north north-west of Parkes, New South Wales. NPM's operations are located within approximately 1,630 hectares of mining leases. Construction of the ore processing plant and associated facilities began in 1993 with open cut mining commencing on the E22 and E27 ore bodies in late 1993. To ensure the ore processing plant operates at full capacity, open cut mining campaigns have typically occurred to provide stockpiles to supplement higher-grade production from underground mining.

The E26 underground block cave mine has been the main source of ore to date and is forecast to continue operating until at least 2020. Access to the mine is via a decline from the surface for personnel/materials with ore transported to the surface via inclined conveyors and a hoisting shaft.

Current operations at NPM comprise the Lift 2N block cave extension, the E48 block cave development project, small scale production from E26 Lift 2 block cave, as well as production from the E22 open cut mine and stockpiles. All ore is processed at the processing plant that has a capacity of approximately 5.8 million tonnes per annum. Approximately 150,000 tonnes of copper-gold concentrate is produced each year.

Description of the E48 Project

On 28 February 2007, the Minister for Planning granted approval (DC 06-0026) for the continuation and underground E48 extension at NPM. Mining of the E48 ore body represents the fourth stage of mine development at NPM and is set to supplement and eventually replace production from the E26 underground operation. The E48 ore body is located close to the existing underground mine infrastructure approximately two kilometres north of E26, and midway between the E26 hoisting shaft and the processing plant. Access to the mine will occur via the existing underground decline and the E48 ore handling systems will also connect into the existing underground material handling system.

The E48 development will comprise approximately 12 kilometres of underground development, construction of 214 draw points, new crusher, workshops and facilities and a new section of underground conveyor. The E48 project also includes the construction of a surface overland conveyor to transport the ore from the hoisting shaft to the ore processing plant for treatment.

What the proponent is seeking in this modification

The existing and approved NPM operation is predominantly an underground mine and associated processing plant focused on the production of copper concentrate for distribution to overseas smelters.

This Section 75W amendment supports an application from North Mining Limited to modify its existing consent.

The proposed modifications to the existing consent considered in this environmental assessment are:

- Construction of a new tailings storage facility "Estcourt" TSF including any associated floor preparation and drainage system;
- Increase the limit on approval to 8.5 million tonnes of ore processed per year;
- Extend the life of the mine through to 2025;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations; and
- Upgrades and modifications to existing processing infrastructure including:
  - Module 1 and 2 Grinding Circuits;
  - Module 1 and 2 Flotation Circuits;
  - Module 3 Flotation Circuit;
  - Concentrate Handling Facilities; and
  - Tailings Handling Facilities.

The NSW Department of Planning has provided Director General's Environmental Assessment Requirements (DGRs) based on the modifications listed above. The Director-General has the right to require that certain matters be addressed within the Environmental Assessment. These DGRs guide the assessment undertaken.

Role of this environmental assessment

The Section 75W modification application is accompanied by this Environmental Assessment, which describes the environmental impacts of the proposed modification and proposed mitigation measures and safeguards.

This Environmental Assessment follows closely the form of the original submission for the Part 3A Project Approval produced by R.W Corkery Pty Ltd (Corkery and Associates, 2006). Essential components of the assessment are:

- The description of the proposed modification, including:
  - Details of amendments to site plan, associated infrastructure and management measures
  - Conditions that need to be modified
- Justification for the proposed modification, including
  - Suitability of the site for the intended purposes

- Stakeholder interest
- Statutory compliance; and
- Environmental Assessment, including
  - A description of the existing environment and approved works
  - Assessment of impacts of the proposed modification
  - Revision of the statement of commitments to include any new mitigation measures and safeguards.

The environmental issues addressed in the original Environmental Assessment Report have been considered in the supporting assessment for the modification.

Specialist input has been targeted at those key issues directly impacted by the modification including:

- Surface and groundwater;
- Biodiversity;
- Noise and Vibration;
- Air Quality;
- Transport;
- Aboriginal Heritage; and
- Rehabilitation.

The original Statement of Environmental Commitments (SEC) has been updated in parallel to the Environmental Assessment Report. The draft SEC contains the proposed management and mitigation measures as recommended by the results of the various specialist studies and reviews for the proposed modification.

Planning Context

NPM is located in an area zoned “Rural” under Parkes Local Environmental Plan 1990 which records “mining” as a permissible land use in that zone.

Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) provides a mechanism to modify approvals granted under Part 3A. Section 75W(2) states that the “Minister’s approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part”. As Department of Planning has determined that the proposal is inconsistent with the existing approval, an application will be submitted to modify the approval. The proposed modification is a project to which Part 3A of the EP&A Act applies.

The Minister for Planning is the approval authority for this proposal, and an environmental assessment (this document) is required to support the application for project modification in accordance with the requirements of the EP&A Act. The environmental assessment addresses the DGRs issued on 26 September 2008.

The environmental assessment provides:

- Information on the proposal, including the need for the proposal, its strategic context and the alternatives considered;
- An assessment of the potential key environmental impacts of the proposal identified by the DGRs; and
- The proponent's commitments to minimise and manage potential impacts.

The environmental assessment focuses on the key assessment requirements specified by the DGRs. It is supported by a number of specialist technical studies, provided as appendices to the main document.

Impact assessment

Environmental impacts are described in Chapter 5 of this environmental assessment. Specialist studies were commissioned to assess potential impacts associated with flora and fauna, air quality, noise and heritage. The specialist reports are provided in Appendices and the findings of these assessments are summarised below.

Flora and Fauna

The proposed modification will have a potentially significant impact on approximately 14.3 ha of remnant habitat including Yellow Box Woodland (Box-gum Woodland EEC) 1.1 ha, Grey Box Woodland and Native Grassland (Inland Grey Box Woodland EEC) 8.5 ha and Bimble Box Woodland (Inland Grey Box Woodland EEC) 4.7 ha.

In particular, the impacts on a local population of the Grey-crowned Babbler from the removal of habitat may be potentially significant.

The ecological impact assessment considered potential impacts of the s.75 modification alongside proposed mitigation measures. The outcome is that the proposed modification would need to be accompanied by an offsets strategy to be developed in consultation with DECC that would:

- Identify 65 ha of land(s) containing appropriate 'like for like' vegetation communities and ensure they are managed for conservation under secure tenure, in perpetuity, either in the NPWS Estate or under a VCA, or equivalent; or
- Agree to an alternative arrangement with DECC that would ensure an equivalent, or better, biodiversity conservation outcome.

On the basis of the assessments undertaken, it is concluded that the proposed modification is unlikely to impose "a significant effect" on any Matters of National Environmental Significance and hence is unlikely to constitute a controlled action as defined under the EPBC Act.

Water Sources

The proponent has existing rights to surface water resources through an arrangement with Parkes Shire Council and to licensed river and bore allocations owned by NPM. The mine achieves a recycle rate of approximately 40% throughout the operations. Together the water sources are considered sufficient to operate at a rate of up to 8.5 Mtpa.

Surface water quality

The existing operation has a comprehensive surface water management system that provides protection of surface water quality in the area. The proposed modification will be integrated into this system to maintain that level of protection.

Groundwater

The key issue of whether there would be significant impacts to groundwater resources in the area through leakage of the tailings storage facilities (TSFs) has been investigated in this EA. It has been concluded that the permeability of the underlying clays is sufficient to protect the resource. Existing monitoring programs will be extended to include the new Estcourt TSF.

Traffic and Transport

Operation vehicles would predominantly remain the same as the E48 project with some minor on-site and delivery changes.

The majority of the traffic movement would occur outside of peak commuter periods and thus the impact on the access route for the regional network and the local road network would be minimal. The intersection of Bogan Road and Adavale Lane has been identified as having spare capacity sufficient to accommodate this traffic under the E48 Traffic Assessment.

The existing road formation and pavement condition for both internal and public roads are such that the proposed construction traffic can be safely accommodated.

Air Quality

The proposed works, including construction activities, are expected to comply with the required air quality criteria and management measures specified in the development consent and E48 Project EA, respectively, with the exception of compliance with the 24-hour PM_{10} criterion under 8.5 Mt throughput operations, which was determined to be marginal.

The 24-hour PM_{10} increment attributable to the proposed works was conservatively estimated to remain below the PM_{10} criterion in the worst case. However, in the assessment of total impact (increment plus background), it is clear that the specification of a representative background PM_{10} concentration is the critical factor in determining compliance with the PM_{10} criterion. If it is assumed that the background PM_{10} 24-hour concentration is in the order of 5 – 15$\mu g/m^3$ it is likely that the total impact of PM_{10} emissions from proposed works would be below the PM_{10} criterion on a day-today basis, provided the specific design and existing operational safeguards detailed in the E48 Project EA are implemented.

Noise

Based on the noise and vibration survey conducted, it is considered that project specific noise goals can be achieved at the nearest potentially affected receivers based on the proposed modifications. There is, however, potential for exceedance of the noise goals during construction of Estcourt TSF under adverse weather conditions and mitigation measures have been recommended to minimise construction noise during these conditions.

Visual

The proposed modification works have been assessed to have a marginal increase in visual impact in an existing visual environment that is heavily affected by existing mining operations.

Aboriginal Heritage

OzArk conducted an assessment for the proposed modifications. The OzArk report documents the Aboriginal cultural heritage assessment undertaken at NPM.

One Aboriginal site, a culturally modified (scarred) tree (NPM-ST1) was recorded.

As the proposed works are likely to damage or destroy NPM-ST1 it is recommended that NPM-ST1 be recorded to archival standards. The archival record should include a full photographic record (on film in both black/white and colour), accurate measurements and descriptions, and a cast of the scar.

It is recommended that specific management of the surface crusher operations involve local Wiradjuri representation to monitor removal of topsoil.

The landforms of the study area were assessed as having overall low potential for the existence of undetected sub-surface archaeological deposits.

Should the above recommendations be adhered to, there is considered no further impediment to the proposed works on the grounds of cultural heritage.

European Heritage

A desktop assessment of *Parkes Local Environmental Plan 1990*, the NSW State Heritage Inventory, NSW State Heritage Register and Register of National Estate was carried out to crosscheck the E48 project work for more recent information.

Fourteen listed items of heritage significance within the Parkes LGA were identified; two (2) are listed on the State Heritage Register, being the Parkes Post Office and the Parkes Railway Station Group. The remainder are individual or group items listed on the Parkes LEP and State Heritage Inventory. No items in the local area are listed on the Register of National Estate.

None of the identified heritage items are located within or within close proximity to the proposed modification sites.

Draft statement of commitments

The environmental assessment provides North Mining Limited's commitments for environmental mitigation, management and monitoring. The draft statement of commitments includes recommended mitigation measures to reduce and avoid identified impacts, management measures to ensure a high level of environmental performance against identified criteria, and measures to monitor performance. The draft statement of commitments would be finalised following exhibition.

Conclusion

The environmental assessment has been prepared by GHD on behalf of North Mining Limited to assist the Minister of Planning in assessing the proposal.

This environmental assessment has been prepared in accordance with Part 3A of the EP&A Act to assess the potential environmental impacts associated with the proposal. The provisions of the *State Environmental Planning Policy 2005 (Major Projects)* apply to the proposal.

The environmental assessment provides an assessment of the potential environmental impacts of the proposal in accordance with the Director-General's requirements issued on 26 September 2008.

Environmental investigations were undertaken during the preparation of the environmental assessment to assess the potential environmental impacts. These included specialist assessment on issues involving potential environmental impacts on flora and fauna; aboriginal heritage; soils and water; traffic and transport; and air quality and noise.

The proposed works are sited within areas identified as being the best available location for the proposal.

The environmental assessment has documented the potential environmental impacts associated with the proposal, considering both potential positive and negative impacts of the proposal, and recommends management measures to protect the environment where required. The main potential impacts requiring environmental management include:

- Direct and indirect ecological impacts from vegetation clearing during construction, and indirect ecological impacts during operation;
- Maximising water efficiency of the NPM operations;
- Aboriginal heritage;
- Adherence to air quality criteria; and
- Adherence to noise criteria.

The proposal includes a number of measures to mitigate the potential environmental impacts. These measures would be implemented by a construction environment management plan for Estcourt TSF and existing operational environmental management plans. These plans would also ensure compliance with relevant legislation and conditions of approval.

The proposed modifications have been designed to address the issues raised by relevant stakeholders.

A high degree of certainty exists about the predicted level of impact upon the biophysical environment given the modification is simply an extension of an existing environmentally responsibly managed operation. The overall environmental impact assessment process has established that the existing operations with the modification proposed would proceed without substantial adverse impacts upon the biophysical environment.

The original Environmental Assessment conclusion is considered to remain valid in that–

"From a social and economic perspective, the approval and operation of the E48 Project would continue to provide positive benefits, particularly to the Parkes and district community"[1]

[1] Corkery and Associates (2006)

1. Introduction and approvals

1.1. Scope

This Environmental Assessment supports a Section 75W application from North Mining Limited to modify its existing development consent (DC 06-0026) to operate a copper and gold mine at Parkes, NSW.

Northparkes Mines (NPM) is located 27 km north-northwest of Parkes. The current and approved Northparkes Mines operation is predominantly underground operations supplemented by open cut mining campaigns. Its associated processing plant is focused on the production of copper concentrate for distribution to overseas smelters.

The proposed modifications to the existing development consent considered in this environmental assessment are:

- Construction of a new tailings storage facility "Estcourt" TSF including any associated floor preparation and drainage system;
- Increase the limit on approval to 8.5 million tonnes of ore processed per year;
- Extend the life of the mine through to 2025;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations; and
- Upgrades and modifications to existing processing infrastructure including:
  - Module 1 and 2 Grinding Circuits;
  - Module 1 and 2 Flotation Circuits;
  - Module 3 Flotation Circuit;
  - Concentrate Handling Facilities; and
  - Tailings Handling Facilities.

The NSW Department of Planning has provided Director General's Environmental Assessment Requirements (DGRs) based on the modifications listed above. The Director-General has the right to require that certain matters be addressed within the Environmental Assessment. These DGRs guide the assessment undertaken.

1.2. Environmental assessment

The section 75W modification application is accompanied by this Environmental Assessment, which describes the environmental impacts of the proposed modification and proposed mitigation measures and safeguards.

This Environmental Assessment follows closely the form of the original submission for the Part 3A Project Approval produced by R.W Corkery Pty Ltd (Corkery and Associates, 2006). Essential components of the assessment are:

- The description of the proposed modification, including:

- Details of amendments to site plan, associated infrastructure and management measures
  - Conditions that need to be modified
- Justification for the proposed modification, including
  - Suitability of the site for the intended purposes
  - Stakeholder interest
- Statutory compliance; and
- Environmental Assessment, including
  - A description of the existing environment and approved works
  - Assessment of impacts of the proposed modification
  - Revision of the statement of commitments to include any new mitigation measures and safeguards

The environmental issues addressed in the original Environmental Assessment Report have been considered in the supporting assessment for the modification.

Specialist input has been targeted at those key issues directly impacted by the modification including:

- Soil and Water;
- Biodiversity;
- Noise and Vibration;
- Air Quality;
- Transport;
- Aboriginal Heritage; and
- Rehabilitation.

The original Statement of Environmental Commitments (SEC) has been updated by GHD in parallel to the Environmental Assessment Report. The draft SEC contains the proposed management and mitigation measures proposed by the results of the various specialist studies and reviews for the construction and operation of the proposed modification to existing NPM operations.

1.3. Planning Context

NPM is located in an area zoned "Rural" under Parkes Local Environmental Plan 1990 which records "mining" as a permissible land use in that zone. In addition to the Major Projects State Environmental Planning Policy (2005), the E48 Project would be constructed and operated with reference to relevant clauses of State Environmental Planning Policies 11, 33, 44 and 55. The proposed modification is a project to which Part 3A of the *Environmental Planning and Assessment (EP&A) Act 1979* applies. The proposal is consistent with the group 2 classification of mining processing listed in Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005*.

The Minister for Planning is the approval authority for this proposal, and an environmental assessment (this document) is required to support the application for project approval in accordance with the requirements of the EP&A Act. The environmental assessment addresses the DGRs issued on 26 September 2008.

The environmental assessment provides:

- Information on the proposal, including the need for the proposal, its strategic context and the alternatives considered;
- An assessment of the potential key environmental impacts of the proposal identified by the DGRs; and
- The proponent's commitments to minimise and manage potential impacts.

The environmental assessment focuses on the key assessment requirements specified by the DGRs. It is supported by a number of specialist technical studies, provided as appendices to the main document.

1.4. The proponent

The Proponent is North Mining Limited, a company that is the manager of the Northparkes Mines joint venture between Rio Tinto (80%) and the Sumitomo Group (20%).

The Rio Tinto group of companies comprises mining, exploration and processing operations in over 20 countries. The Rio Tinto group, a group committed to environmental sustainability, employs approximately 35 000 people worldwide.

The Sumitomo Group, through Sumitomo Metal Mining Co. Ltd is the owner of one of the world's most advanced smelters. The joint venture operates under the business name of Northparkes Mines.[2]

1.5. Existing approvals

The NPM operations have been operating since 1993 following the grant of the original development consent (DA504/90) by the NSW Land and Environment Court.

Details of development consents and the various licences held by the Proponent are outlined as follows.

Development Consents

The following Development Consent is held by North Mining Limited:

- The Project Approval 06-0026 granted on 28 February 2007 by the Minister for Planning under the *Environmental Planning and Assessment Act 1979*. A single consolidated planning approval was sought for all ongoing and new activities to provide clarity for site management and State/Local Government regarding the operating conditions for the Northparkes Mines under the *Environmental Planning and Assessment Act 1979*. The seven development consents previously granted by

[2] Corkery and Associates (2006)

Parkes Shire Council were surrendered six months from the receipt of the consolidated planning approval.

Licences

The following approvals are held by North Mining Limited:

- Environment Protection Licence 4784 (granted 30 May 2001) for the mining of >5 Mt of ore per annum, administered by the Department of Environment and Climate Change (DECC);
- Water Access Licence 70AL603187 administered by the Department of Water and Energy (DWE);
- Water Access Licence 70AL600028 administered by DWE;
- Bore licences for groundwater monitoring, administered by DWE;
  - E22 Pit - 80BL241019
  - E26 Pit – 80BL241042
  - E27 Pit – 80BL241023
  - E48 Pit – 80BL241020
- Extraction bore water licences, administered by DWE;
  - 70BL226550 “Avondale”
  - 70BL229975 “Avondale”
  - 70BL228240 “Avondale” bore 7
  - 70BL226584 “Avondale” bore 8
- Dangerous Goods Licence No. 35/029083, administered by WorkCover NSW; and
- Licence to Store (Explosives) No. 07-100146-001, administered by WorkCover NSW.

Other Approvals

Approval was granted from the Roads and Traffic Authority (RTA) and Parkes Shire Council 19 November 1999 to allow road train access on Bogan Road.

1.6. Approvals required

The following statutory approvals and licences would be required to allow the establishment and operation of the proposed modifications to the existing operations.

Planning Approval – Minister for Planning

The proponent is seeking a modification to the Development Consent 06-0026 from the Minister for Planning under Section 75W of the EP&A Act.

Environment Protection Licence – Department of Environment and Climate Change

The existing Environment Protection Licence (EPL 4784) may require variation to include the proposed modification works / activities under Clause 43 of the *Protection of Environment and Operations Act 1997*.

1.7. Other relevant documentation

1.7.1. Mining Operations Plan

A Mining Operations Plan (MOP), approved by the Department of Primary Industries (Mineral Resources) (DPI (MR)), was required prior to commencement of E48 Project mining. To ensure that mine planning and operations across the entire site are consolidated and integrated, it is anticipated that the existing MOP would be revised to include the proposed modifications and submitted to DPI (MR) for approval. The revised MOP would retain the existing general document structure and would conform to the requirements of the Mineral Resources (2002) *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (EDG03).[3]

1.7.2. Annual Environmental Management Report

The Proponent compiles an Annual Environmental Management Report (AEMR), that is distributed to relevant Local and State government agencies and community stakeholders. Following the issue of the relevant approvals and licences, information on the proposed modification would be incorporated into future AEMRs. Each AEMR presents information on the operation's performance against environmental targets, identifies areas for improvement and is also prepared generally in accordance with the requirements of the Mineral Resources (2002) Guidelines *to the Mining, Rehabilitation and Environmental Management Process* (EDG03). [4]

[3] Corkery and Associates (2006)

[4] Corkery and Associates (2006)

2. Existing operations at Northparkes Mines

2.1. Introduction

The operations described in this Chapter are those of the mine as updated to include the E48 project, approved in February 2007.

2.2. Northparkes Mines history

The NPM operations involve the mining and processing of porphyry related copper-gold deposits. The establishment of operational infrastructure commenced in 1993 with the construction of the carbon-in-pulp (CIP) gold processing plant. Since that time, the operation has expanded to include two open cut mines and an underground mine, along with a number of processing plant changes. The development of the operation is summarised in Table 1.

Table 1 Development History

Construction of the carbon-in-pulp gold processing plant commences	April 1993
Development of E26 underground mining infrastructure commences	April 1993
Campaign open cut mining commences in E27	December 1993
Campaign open cut mining commences in E22	January 1994
Tailings Storage Facility 1 commissioned	May 1994
Construction of copper flotation processing plant commences	November 1994
Infrastructure development of E26 Lift 1 extraction level commenced	May 1995
CIP processing plant ceases operation due to lack of suitable ore	September 1995
Copper flotation processing plant commissioned	September 1995
E26 clay pre-strip commenced	June 1996
Caving in E26 Lift 1 commenced via undercut levels	June 1996
Block caving in the underground E26 Lift 1 mine commenced	November 1996
Tailings Storage Facility 2 commissioned	February 1997

Underground mining rate reaches full production (4.1 Mtpa)	September 1997
Open cut mining in E22 and E27 ceases with completion of mining contract	November 1998
E26 Lift 1 block cave reached surface and subsidence commenced	November 1999
E22 open cut cutback mining commences	July 2000
Tertiary mill added to the processing plant	December 2000
Underground E26 Lift 2 development commenced	March 2001
E22 open cut cutback mining completed	June 2002
E27 open cut cutback commenced	February 2003
E26 Lift 1 mining completed	October 2003
E26 Lift 2 mining commences	August 2004
E27 open cut mining completed	September 2005
E26 Lift 2 North development commenced	November 2006
E48 development commenced	February 2007
E22 open cut cutback campaign commence	November 2007
E26 Lift 2 mining ceased	November 2007
E26 Lift 2 North mining commences	March 2008
E26 Lift 2 mining partial recommencement	2008 (throughout)

2.3. Geology, ore bodies and reserves

NPM operations are located within the Lachlan Fold Belt of central western NSW, which incorporates the Bogan Gate Synclinorial Zone around Parkes and has been host to many mineral discoveries of local, regional and national importance.

Four primary areas of mineralisation have been identified within the NPM lease area, namely E22, E26, E27 and E48. All of these deposits occur along the northeastern corner of the Bogan Gate Trough. The copper-gold deposits at NPM are hosted by the Goonumbla Volcanics, which comprise a sequence of volcanic and sedimentary units of Ordovician age (approximately 460 million years ago).

2.4. Existing site layout and infrastructure

Figure 1 shows the location of NPM relative to Parkes Shire and NSW. Figure 2 depicts the surface infrastructure and layout at the NPM operations. The components of the existing NPM operations include the following.

- Two open cut mines, E22 and E27, surrounded by ore stockpiles, waste rock dumps and a sound bund. The open cut mining contractor laydown area is located to the south of these open cut mines. Mining has ceased in the E27 open cut mine, however, mining of low-grade ore has recommenced in the E22 open cut pit;
- The E26 underground block cave mine and resultant surface subsidence crater. Surface infrastructure includes the portal, mining offices, hoisting shaft, ventilation fans and transfer and overland conveyor. Marginal ore stockpiles, waste rock dumps and stockpiles of clay and oxide material are located around the surface crater outside the predicted final subsidence limits. Underground mining contractor laydown areas are established on the surface around the mining offices;
- The E48 project to date includes development of approximately 11,700 metres of tunnels and installation of underground infrastructure (e.g. crusher and material handling system). Installation of surface infrastructure is still to be completed and the surface subsidence zone from mining activities is yet to form.
- The processing plant including surface crusher, crushed ore stockpiles, active grinding mills, froth flotation area and concentrate storage;
- Service infrastructure includes administration building and change rooms, core shed, laboratory, emergency response shed, warehouse, workshop and associated roads and electrical infrastructure;
- Surface contractor laydown areas;
- Two tailings storage facilities and associated infrastructure; and
- An overland conveyor to transport ore from the hoisting shaft to the ore processing plant stockpiles.

In addition to the above activities, the Proponent farms the bulk of its 6,115 ha landholding including much of the 2,456 ha of land within the two existing mining leases.

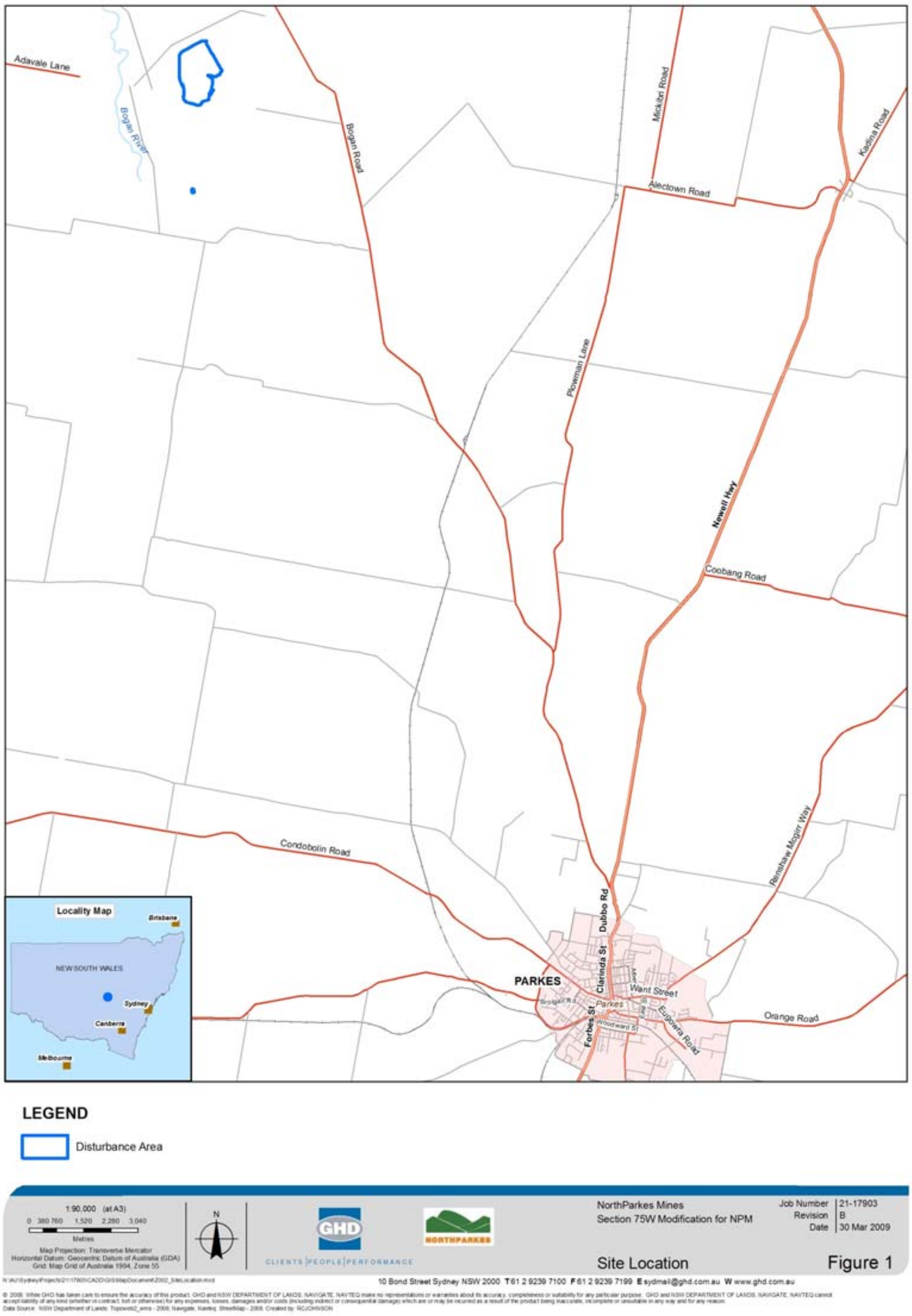


Figure 1 Site location

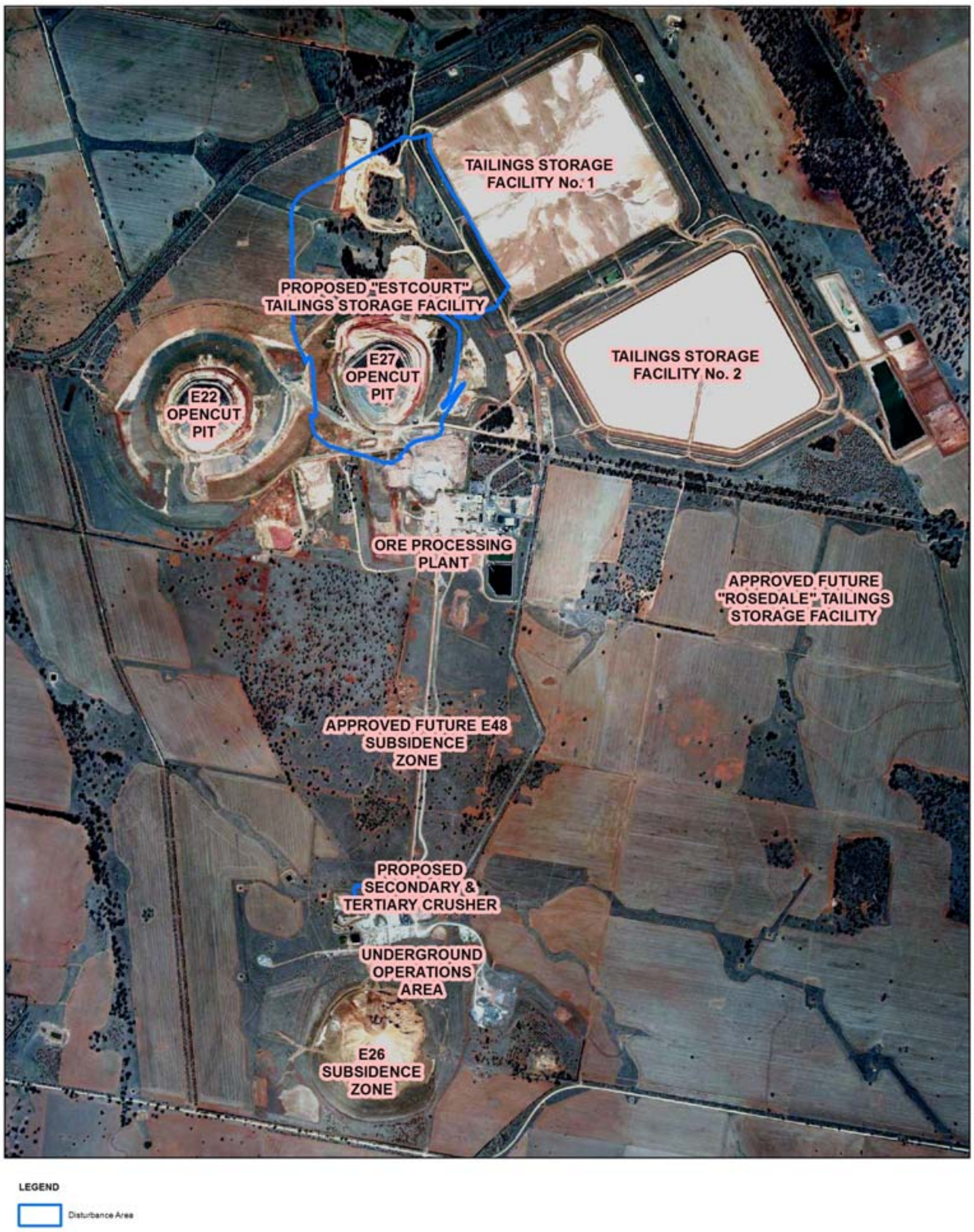


Figure 2 Surface infrastructure & proposed disturbance areas

2.5. Mining operations

2.5.1. Open cut mining

Campaign open cut mining at the operation has previously been conducted in the E22 and E27 open cut mines (Figure 2). To date, the ore produced from the open cut mines has been blended with ore from the E26 underground mine. Open cut mining ceased in the E27 open cut mine with the final mining campaign between February 2003 and September 2005. At present, mining of a cutback at the E22 open cut pit is in progress. It is expected that mining of the E22 open cut pit will cease in 2010.

Open cut mining at NPM uses conventional mining methods, involving excavators and haul trucks, and uses a 10 m drill and blast depth to create 5 m high operational faces with an overall wall angle of approximately 35°.

Ore mined within the open cuts is hauled to the ore stockpiles adjacent to the surface primary crusher and is generally processed as a blend with the higher-grade underground ore. A substantial amount of open cut ore is stockpiled in various locations on site.

2.5.2. Underground mining

Underground mining is currently undertaken within the E26 ore body, using block caving methods. The pipe-like ore body has been mined in two lifts. The first lift (Lift 1) extends from surface to approximately 480 m below the surface, while Lift 2 extends to approximately 830 m below the surface. Mining in Lift 1 was completed in October 2003. E26 (Lift 2) development commenced in March 2001 and production mining was commenced in August 2004. In November 2006 the Lift 2 footprint was extended to the north with the addition of three additional extraction drives. The construction of these additional drives was completed in March 2008.

Approximately 17 km of tunnels have been developed to create E26 Lift 2 and Lift 2 North. A total of 161 drawpoints, 350 metres below the Lift 1 extraction level, have been developed through which the broken rock is drawn.

All ground movement occurring within (and outside of) the subsidence zone is monitored regularly through a geotechnical monitoring system which includes several wire extensometers, crack extensometers, survey prisms, photographic records and detailed aerial photogrammetry.

Figure 3 shows the general flowchart for site operations from mining to the customer.

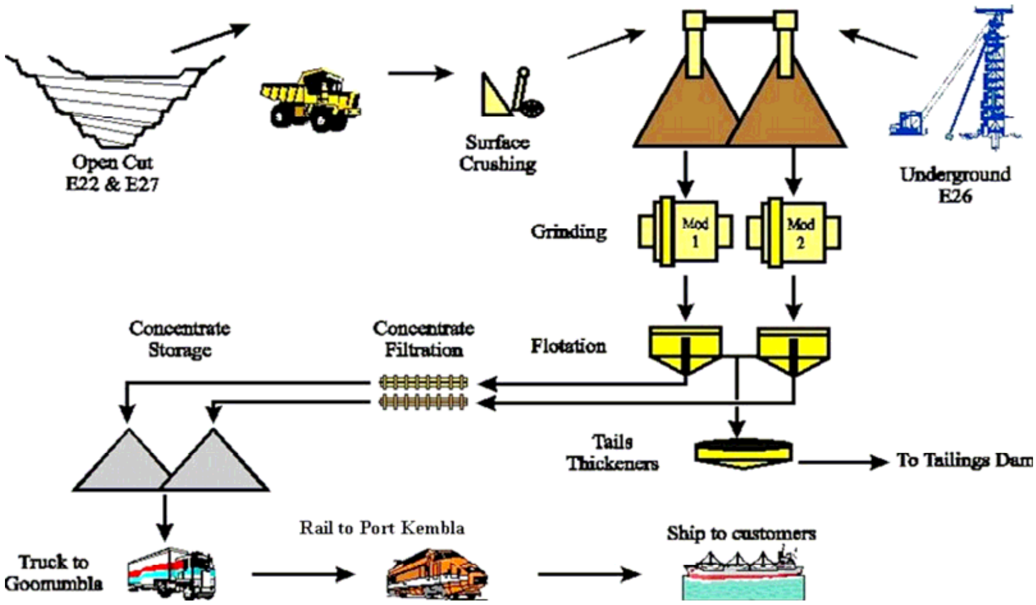


Figure 3 Mine to Customer Flowchart

2.6. Ore stockpiling and processing

2.6.1. Ore stockpiles

All ore from underground operations and open cut operations is stockpiled beneath the rill towers adjacent to the processing plant. The quantity of ore within this stockpile typically varies between 150,000 t and 300,000t. Underground ore is preferentially fed into the processing plant because of its higher grade.

2.6.2. Processing

All ore is currently processed within a conventional froth flotation plant. The plant, commissioned in September 1995, is designed to process both copper-gold oxide and sulphide ore.

Sulphide copper-gold ore is floated using a standard process where the copper and gold-bearing sulphide minerals are recovered using xanthate as the primary collector and MIBC as the frother.

Concentrate produced from the flotation circuit is thickened and filtered to produce a final concentrate containing 7% to 10% moisture which is stored, transported and marketed. The first train load of concentrate left the Goonumbla Rail Siding for the port of Newcastle in December 1995 and continued to be railed to Newcastle until 2003. Since that time, the concentrate product has been transported to Port Kembla and shipped to customers in Australia and overseas.

2.7. Waste rock management

Waste rock and clay across the NPM operations are stored in either stockpiles or dumps. Stockpiles refer to the storage of material that is likely to be used in the future, primarily in construction or rehabilitation works, and as such, is not rehabilitated as a final landform. Dumps refer to the storage of material that is not anticipated to be used in the future and will form part of the final rehabilitated landform of the site.

Some waste rock has been used in the construction of the TSFs, with the remainder currently stored in a number of locations on the mine site (listed in Table 2 and illustrated in Figure 4). Generally, open cut waste rock has been placed in the open cut sound bund while underground waste rock was placed in the E26 Lift 1 mullock stockpile, E26 oxide waste rock dump and E26 Lift 2 waste rock dump. Additionally, a clay stockpile was created adjacent to the process water dam to store the material extracted for the dam construction. An additional clay dump was constructed to the east of the E26 subsidence zone to store pre-strip material from above the E26 ore body.

Table 2 Mineral waste locations

Dump/Stockpile	Height (m)	Volume (m^3)	Approximate Surface area (m^2)
Process water dam stockpile	10	121,126	22,790
W1	20	3,814,291	350,633
W2	20	7,801,848	644,403
W3	20	4,030,924	289,879
W4	14	2,007,700	210,425
E26 Lift 1 mullock dump	14	767,373	80,607
E26 clay dump	15	880,253	93,303
E26 Low grade oxide ore	7	52,545	33,666
E26 Lift 2 waste rock dump	15	318,735	72,348
E26 oxide waste dump	15	Note 1	126,777
TSF 1	24	28,658,747	1,200,000
TSF 2	25	27,610,657	1,100,000

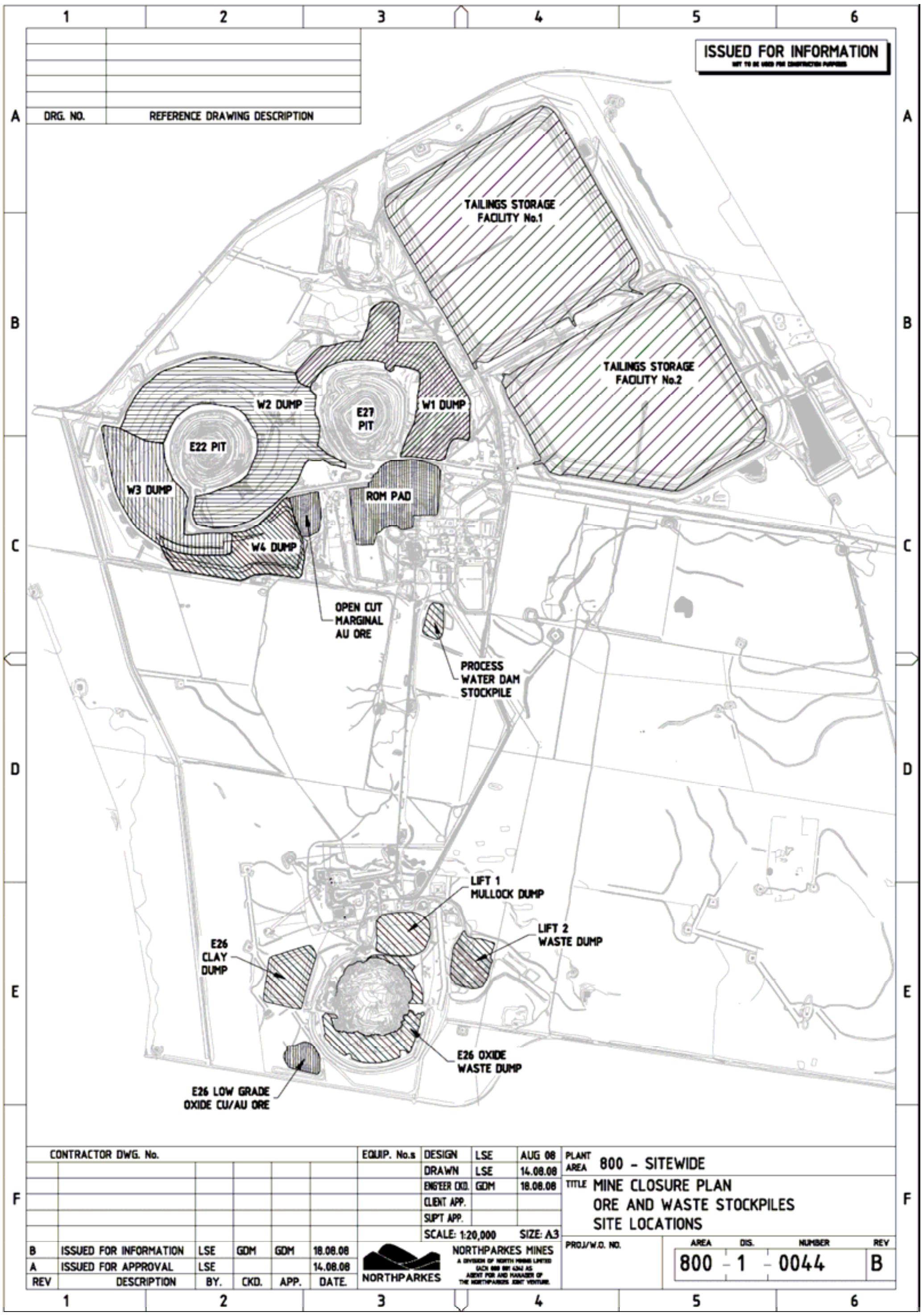


Figure 4 Waste rock stockpiles

2.8. Tailings management

NPM currently discharges all processing tailings within TSF 1 and TSF 2, approximately 2 km north of the processing plant. The two TSFs share a common return water dam, located between the two embankment walls.

Water recovery from the TSFs averages in the order of 25% and final settled density of the tailings is approximately 1.37 t/m^3.

The typical tailings composition is shown in Table 3.

Table 3 Typical Tailings Composition

Chemical	Concentration
Orthoclase $KAlSi_2O_8$	69%
Silica, Crystalline – Quartz SiO_2	<18.1%
Additives	6.4%
Illite	3%
Mica	2.3%
Aluminium Silicate $Al_2O_3SiO_2$	0.9%
Water	<1%
Copper sulphides	0.2%

Tailings deposition

The tailings are sub-aerially deposited into the active TSF and tailings liquor and runoff is contained and directed to the internal central decant tower.

The TSFs have been designed to provide:

- Safe and permanent containment of all tailings solids;
- The recovery of free water for reuse within the processing plant;
- Containment of all water under extreme rainfall conditions;
- Maximum structural strength through the deposited tailings; and
- Containment of all chemical residues.

The features of both TSFs include:

- A rock fill or clay perimeter starter embankment;
- Successive lifts by the conventional upstream method using a distribution pipeline around the perimeter; and
- A central decant tower continuously feeding the common return water dam (RWD) from which the reclaimed water is recycled back to the processing plant.

The lifts used to raise the TSF walls are approximately 3m to 5m high.

Water management

The RWD captures supernatant water from both TSFs and has a maximum storage capacity of 14,000 m^3, representing approximately 36 hours of processing plant water requirement. An alarm system is activated when the RWD water level reaches 95% of capacity to ensure evasive action can be taken and the freeboard maintained.

The total freeboard in each TSF allows for a 1 in 100 year 72 hr duration rainfall event. It must be maintained at a minimum of 1 m, but is usually much greater, as the water level is kept at a minimum.

Three monitoring bores are located down gradient of TSF 1 and four monitoring bores are located around TSF 2. Supernatant water is removed from the surface of the tailings storage facility via a central decant tower that delivers the water through a buried outfall pipeline to the RWD. The drain in each TSF feeds to eight outlets, which connect to a ring main on the outer walls. Water is then gravity fed to the RWD. Approximately 25% of water is recovered from the TSFs.

Both TSFs are 'designated dams' and as such are regulated by the NSW Dams Safety Committee.

2.9. Transportation

External road network

Access by road to the operations is principally from Parkes via Bogan Road. This road carries all of the heavy traffic, and most of the employee traffic. Access is also possible from Peak Hill via three local roads, namely Coradgery Road, Robertson Road and Taweni Road. Other local roads from other centres feed into these roads.

Internal road network

Within the NPM operations, there are a number of internal roads. The roads around the administration offices and processing plant are sealed and the road between the underground surface facilities and the processing plant is sealed. The remainder of the roads are well-maintained gravel roads.

Access to main internal roads throughout the operations is controlled by a security system that involves swipe card-operated boom gates.

Employees and supplies

Approximately 72% of employees live in Parkes and 83% of employees predominantly travel to the NPM operations from Parkes, via Bogan Road.

Consumables, various supplies and machinery are delivered to the NPM operations via Bogan Road from Parkes.

Typically there are approximately 19 truckloads of consumables and supplies (i.e. 38 truck movements) per week, (16 deliveries and 3 dispatches). Grinding media are delivered from Sydney or Newcastle in B-doubles or single trailers (24t to 36t). All other deliveries are via single trailer or single tanker trucks.

Peak hour two way traffic flows on Bogan Road occur between 6:00 am and 7:00 am and 7:00 pm to 8:00 pm Monday to Friday with around 90 vehicles per hour as shift workers and some day workers travel to and from work. The remaining day workers predominantly commute between 7:00 am to 8:00 am and 4:00 pm to 5:00 pm, Monday to Friday. Weekend traffic is limited principally to contractors and shift workers.

Product transportation

Copper-gold concentrate product is trucked from the processing plant in closed, purpose-built containers on a road train to the Goonumbla Rail Siding, 13.5 km from the processing plant along Bogan Road towards Parkes.

On average, 60 loads are dispatched weekly to the Goonumbla Rail Siding with each load comprising two containers with a total 58t capacity of copper-gold concentrate. The gross weight of each road train is 80t. Once delivered, the containers are stored adjacent to the siding and then loaded onto flatbed rail carts. Two trains are dispatched each week to Port Kembla.

Product road train transportation does not occur during peak school traffic times, i.e. 7:30 am to 9:00 am and 3:00 pm to 5:00 pm on school days. Additionally, product road trains are speed limited to 80 km/hr.

2.10. Services

2.10.1. Electricity

Electricity is supplied by Energy Australia through a 132 kV power line to the NPM site, fed from the Parkes 132 zone substation situated on the Parkes-Condobolin Road. NPM own and operate a 132 / 11 kV substation, 11 kV power lines and harmonic filter yard on site.

2.10.2. Water

Water is required at the mine for the processing plant, mining activities, dust suppression and general potable water requirements. On an annual basis, approximately 5,350 ML of water is used by the operations. This is made up of fresh water supplied by Parkes Shire Council (PSC), water recovered from the TSFs and captured surface water runoff.

NPM experienced water shortages during 1995, 1996 and 1997 due to extended drought conditions, which led to detailed investigations into additional water sources. Following regional hydrogeological investigations in 1996 that failed to find sufficient groundwater supplies to meet site requirements, the following modifications were progressively undertaken to provide additional water:

- Construction of a second water supply pipeline from Goonumbla to the mine site, upgrading of the existing High Street pumping station and construction of a 1.2 ML storage tank located 2 km from the mine site;

- Purchase of existing water allocations and obtaining permission to pump the allocation through the PSC's facilities via a joint water users license as a backup in critical conditions;
- Storage of rainfall and runoff in the open cut pits and various water storage dams around the mine site;
- Storage of process water and tailings decant in the E22 and E27 open cut voids;
- Storage of water in the Estcourt and Caloola borrow pits;
- Installation of a river water treatment plant on site;
- Purchase of farm land in Forbes with groundwater entitlements; and
- Installation of bores on the Forbes property, to be linked into the existing PSC infrastructure.

2.10.3. Liquid fuels and LPG

Storage locations for liquid fuels and LPG are designed and operated to comply with AS 1940 (2004), constructed with concrete bunds (where required) and all storages are unroofed. Liquid fuels and LPG are listed on the NPM operations Dangerous Goods Licence.

2.10.4. Sewerage

Domestic sewage from the operation is processed by two treatment plants located next to the processing plant and the underground operations buildings, with the resultant water pumped back to the processing plant. Biocycle units or two stage septic systems are used by contractors as required.

2.10.5. Communications

External telecommunications are provided by Telstra using the digital mobile and landline network. Internal communications on site are via portable VHF radios and telephones. The farm operation uses UHF communication and Telstra digital mobile phones.

2.11. Non-mineral waste management

2.11.1. Waste characteristics

The principal non-mineral wastes that are generated by NPM include:

- General domestic-type wastes from on-site buildings and product packaging;
- Oils and grease; and
- Sewage.

2.11.2. Management of non-mineral wastes

Domestic-type wastes and routine maintenance consumables

All general wastes originating from the site offices, amenities and ablutions buildings are disposed of in 2 m^3 skip bins or mobile garbage bins (1 m^3 or 0.25 m^3) located adjacent to the various buildings. These bins are generally collected twice weekly, the waste is disposed of in the Parkes Shire landfill.

Recycling programs are in place for paper, cardboard, lead batteries, aluminum cans, printer cartridges, grease, oil and scrap steel.

A major waste contractor provides a site-wide waste management service to manage all non-mineral waste recycling and waste disposal.

Oils and grease

General maintenance of the underground mining fleet is conducted in the underground workshop, while routine maintenance of surface mining and earthmoving equipment, and periodical maintenance of underground equipment, is undertaken in the surface workshop buildings associated with the underground, ore processing and open cut operations. Waste oils are stored in a bunded area at the workshop buildings and collected by a licensed waste contractor approximately every 2 weeks for recycling. Waste grease is stored in a bunded area and dispatched to a licensed treatment facility on an as needs basis.

Sewage

Effluent from the two treatment plants on site is disposed of into the process water system. An approved contractor disposes of sewage sludge from the two stage septic systems.

2.12. Safety and security

2.12.1. Safety

NPM recognises that the proximity and visibility of the NPM operations to adjacent rural properties, and the high profile that the operations have within Parkes Shire, necessitate the implementation of procedures and controls to protect the safety of the public in general, as well as local landowners and land users. Measures are also required to ensure the security of the mine facilities and equipment from unauthorised access or use by visitors to the mine, contractors or employees. It is NPM's policy that each person employed on or visiting the site is provided with a safe and healthy working environment. This approach is reflected in the NPM Environment, Safety and Health (ESH) Policy.

2.12.2. Explosives

Explosives are used for open cut mining, in the underground operations to clear blockages from draw points (i.e. secondary breaking) and for underground development. Explosives are stored, managed and used onsite according to regulatory requirements.

2.12.3. Site Access Control

A 20 km perimeter fence is located around the entire mine site and is signed at regular locations to advise of the mining operations. Additionally, a 1.8 m high chainmesh fence prevents public access to the processing plant and administration buildings. A 1.8 m high chainmesh fence also encloses the E26 subsidence zone.

Access to operational areas is controlled by swipe card-operated boom gates.

An access control office is located at the entrance to the site to ensure that all visitors and contractors are appropriately inducted and their entry and exit from the site is appropriately recorded. All un-inducted visitors are fully escorted during their time on site.

2.13. Employment and economic contributions

2.13.1. Employment

During development of the E48 project NPM had approximately 280 full-time employees (Table 4) plus approximately 700 full time equivalent contractors in the following general areas.

Table 4 NPM Full time Employment

Area	Male	Female	Total
Mining	131	9	140
Ore Processing	77	8	85
Administration	30	27	57
Total	**238**	**44**	**282**

Under normal operations NPM has approximately 230 full-time employees plus approximately 300 full time equivalent contractors.

2.13.2. Economic contributions

NPM is active in the Parkes Shire community through sponsorship and donations to a variety of community organisations throughout the region. In 2008 community investment totalled $1.9M and included contributions to initiatives in agriculture, culture, education, environment, health, recreation and transport.

2.14. Site rehabilitation

Rehabilitation at NPM incorporates the entire landholding and not just the area covered by the mining leases. Progressive rehabilitation conducted onsite is integrated with the surrounding NPM owned land and is managed with a view to enhancing the regional landscape and native habitat values.

2.15. Environmental management, farm management and monitoring

2.15.1. Environmental management

NPM operations are undertaken in accordance with a certified ISO14001 environmental management system (EMS). The EMS ensures that all mining, processing and associated activities are undertaken in an environmentally responsible manner and minimise impact on the surrounding environment and residents.

As NPM is part of the Rio Tinto Group, all activities are conducted in accordance with the Rio Tinto "The Way We Work" and Environmental Standards.

Environmental management at NPM is documented through a number of sitewide management plans including:

- environmental noise;
- hazardous materials and contamination control;
- energy and greenhouse gas
- environmental dust;
- geochemical assessment, acid rock drainage and mineral waste;
- non-mineral waste;
- tailings dam operators manual;
- topsoil;
- flora and fauna;
- conceptual mine closure;
- three year rehabilitation plan; and
- water management plan.

In addition, a range of environmental monitoring is undertaken and reported, along with any alterations to related management strategies, in the AEMR.

2.15.2. Farm management

NPM owns approximately 4,400 ha of land surrounding the NPM operations that acts as a buffer zone for the mine site. As a responsible landowner, NPM actively manages this area as farmland. A dedicated Farm Manager is employed to manage this land.

Cropping is undertaken within large paddocks (approximately 200 ha), divided by tree lines acting as wildlife corridors. All stock has been removed from the area to reduce erosion, compaction and improve regeneration of tree lines.

The farm uses conservation farming techniques to reduce compaction and improve both soil and environmental quality.

Additionally, areas of remnant forest within the farmland, particularly along Bogan River, Goonumbla Creek and the ridgelines on the “Rosedale” and “Rocklands” properties, are progressively regenerated.

2.15.3. Site monitoring

To ensure that NPM do not effect the local environment to an extent greater than that predicted, a variety of monitoring is undertaken.

Table 5 lists the monitoring undertaken across the operations.

Table 5 NPM Monitoring

Environmental Aspect	Location(s)	Monitoring Type	Frequency
Meteorology	1.5 km east of E26 hoisting shaft	Weather Station	Continuous
Surface Water	Farm dams and water courses	Water levels and water quality	Annually and/or after flow events
	Sediment ponds	Water levels and water quality	Quarterly and after flow events
	Process water system	Water levels and water quality	Quarterly
Groundwater	Tailings bores	Water levels and water quality	Quarterly
	Underground bores	Water levels and water quality	Quarterly
	Regional bores	Water levels and quality	Quarterly
	Open cut bores	Water levels and quality	Quarterly
Air quality	11 depositional dust gauges	Deposited dust	Monthly
	2 HVAS units	Particulate Matter (<10μm)	6 day cycle

Environmental Aspect	Location(s)	Monitoring Type	Frequency
Blasting	‘Hubberstone’ property	Overpressure	Every surface blast
	‘Hubberstone’ property	Vibration	Every surface blast
Noise	Surrounding residential properties	Unattended noise	Quarterly
	Surrounding residential properties	Attended noise	Quarterly
Vegetation	Rehabilitated areas	Rehabilitation growth health	Annual
	Remnant native vegetation	Vegetation growth health	Annual
Weeds	Entire NPM site	Visual observation	Seasonal
Fauna	Entire NPM site	Observations	Continuous
Land Management	Entire NPM land holding	Visual observation of fences, water flow, soil fertility, etc	Biannual

2.16. Community relations

NPM is the largest employer within the Parkes and Forbes Shires and continues to maintain strong, positive relationship with the local and wider community. The following are examples of how NPM currently interacts with the community and stakeholders:

- A direct phone line is provided for complaints. One complaint was received in 2007 relating to non-environmental issues. Five complaints were received in 2008, primarily relating to off site, non-environmental issues;
- Operation of a tour program which provides students, groups and tourists the opportunity to view the site;
- Support of the NSW Minerals Council education bursary scheme in 2007 and 2008 as well as the Envirosmart program;
- Sponsorship and donations throughout the local community including Parkes, Forbes, Peak Hill and Trundle;
- Information sessions held with surrounding landowners on a bi-annual basis;
- Regular meetings with the Community Consultative Committee;

- Meetings with the Parkes Borefield Community Consultative Committee which includes representatives from the Southern Cross Landholders, PSC and NPM;
- Work experience program: during 2008, 22 students participated in a work experience program at NPM; and
- Consultation and relationship building with the local Aboriginal community including the signing of an Memorandum of Understanding “Working Together” and regular meetings with the AHWG which includes representatives from the Wiradjuri Council of Elders and the Peak Hill Local Aboriginal Lands Council.

3. Description of the Proposed Modifications

3.1. Outline of the project

3.1.1. Introduction

The proposed modifications will enable an extension to the life of the mine that will see the continued extraction of copper and gold in a manner which is both economically viable and environmentally responsible. This will result in the continued positive benefits, particularly to the Parkes and district community, from a social and economic perspective.

3.1.2. Project Site

The sites subject to the modification works are shown in Figure 2 above. The Estcourt TSF site is shown in more detail in Figure 5.

3.1.3. Existing site components and activities

The existing components of NPM operations for which planning approval was sought and approved include:

- E26 underground mine, associated subsidence zone and waste rock / clay dumps;
- E48 underground mine, associated subsidence zone and waste rock dump;
- E26 and E48 underground mine portal, hoisting shaft and exhaust fan;
- E26 and E48 underground mine surface infrastructure and services;
- E48 overland conveyor/service corridor;
- Existing E26 overland conveyer and E26 service road;
- Processing plant and rill tower stockpile and ROM pad;
- Tailings Storage Facilities 1 and 2 and return water dam;
- Tailings Storage Facility 3 (Cells A and B) and return water dam;
- Infill between Tailings Storage Facilities 1 and 2.
- Administration and training buildings, car parks and various infrastructure and services;
- Process water dam, Caloola, Estcourt and Rosedale borrow pits and water storages;
- Various open cut waste rock / clay stockpiles and dumps;
- Mine access road and various internal roads and tracks;
- E22 open cut mine (continued mining envisaged and subsequent tailings disposal - approved for tailings disposal);
- E27 open cut mine (used for water storage and approved for tailings disposal);

- Various compounds for equipment storage and services;
- Sound bund and numerous tree lots;
- A 45 ha addition to Limestone National Forest (as a land swap); and
- Various ancillary components and activities to the above components.

3.1.4. Overview of the proposed modifications

The main components for which planning approval is now being sought include:

- Construction of a new tailings storage facility "Estcourt" TSF including any associated floor preparation and drainage system;
- Increase the limit on approval to 8.5 million tonnes of ore processed per year;
- Extend the life of the mine through to 2025;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations; and
- Upgrades and modifications to existing processing infrastructure including:
  - Module 1 and 2 Grinding Circuits;
  - Module 1 and 2 Flotation Circuits;
  - Module 3 Flotation Circuit;
  - Concentrate Handling Facilities; and
  - Tailings Handling Facilities.

Each of the above components is discussed in detail in the following sections.

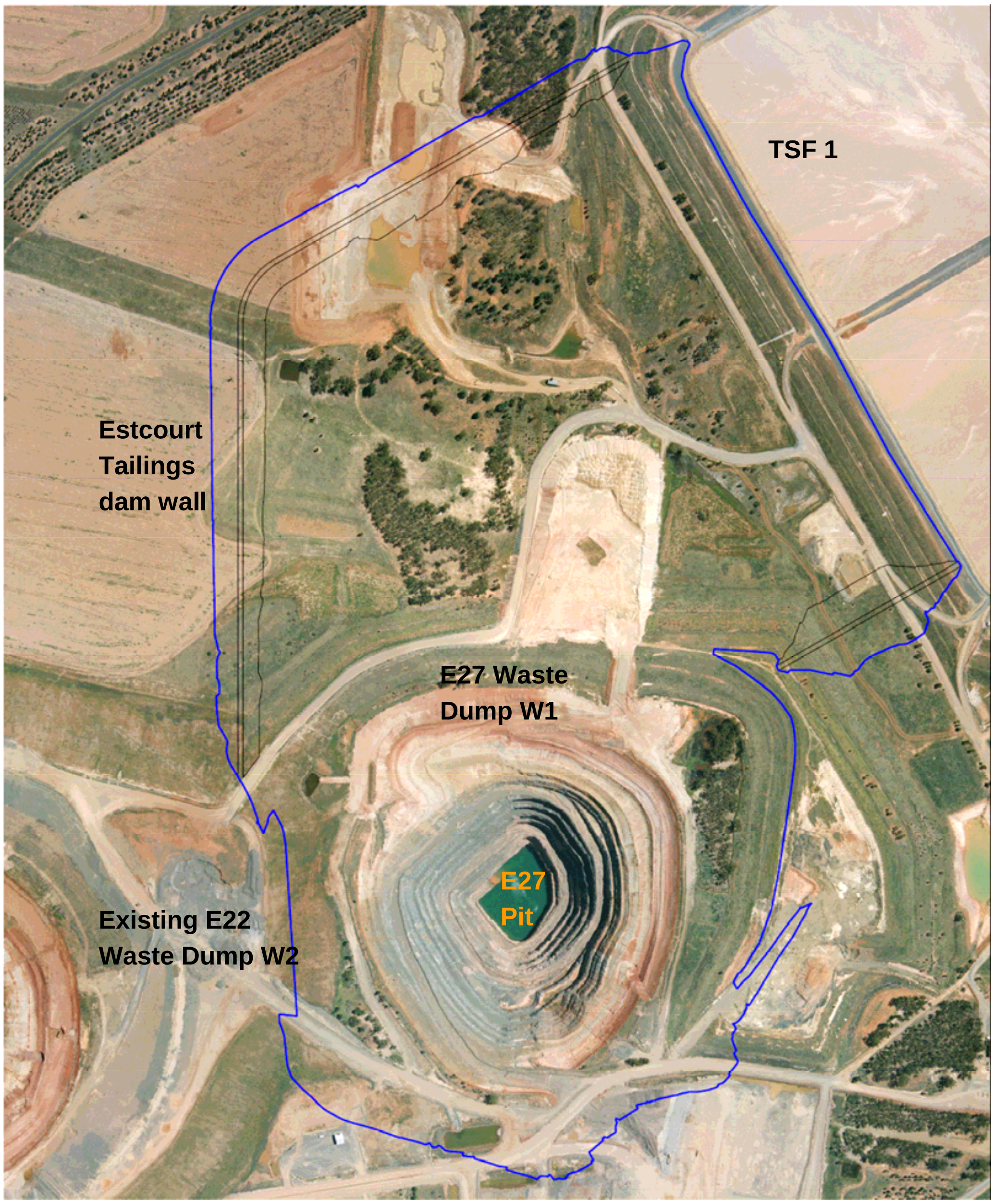


Figure 5 Estcourt TSF area, including E27 pit

3.2. Ore Bodies and Reserves

NPM's Life of Mine (LOM) plan, which is based on ore reserves for both the underground mines E48 and E26 Lift 2N and the open pit E22 mine, contains 90.4Mt at 0.8 % Cu and 0.3 g/t Au. Table 6 and Table 7 summarise the stated mineral resources and ore reserves as at 31 December 2008.

Table 6 **Mineral resources as at 31 December 2008**

Deposit	31 December 2008 Tonnes (M)	Grade Copper %	Grade Gold g/t	31 December 2007 Tonnes (M)	Grade Copper %	Grade Gold g/t
Measured Resource						
E22	0	0	0	8.4	0.6	0.4
E26	8.6	1.0	0.4	5.6	0.9	0.3
E48	0	0	0	10.3	0.8	0.3
Total Measured	8.6	1.0	0.4	24.3	0.7	0.3
Indicated Resource						
E22	0	0	0	3.6	0.4	0.2
E26	2.5	0.7	0.1	0.8	0.8	0.2
E48	0	0	0	1.6	0.5	0.2
Total Indicated	2.5	0.7	0.1	6.0	0.5	0.2

Table 7 **Ore Reserves as at 31 December 2008**

Deposit	31 December 2008 Tonnes (M)	Grade Copper %	Grade Gold g/t	31 December 2007 Tonnes (M)	Grade Copper %	Grade Gold g/t
Proved Reserve						
E22	6.7	0.5	0.4	0	0	0
Sulphide Stockpiles	0.5	0.3	0.2	0.7	0.7	0.6
Total Proved	7.2	0.5	0.4	0.7	0.7	0.6
Probable Reserve						
E22	2.7	0.4	0.2	0	0	0
E26	17.3	0.8	0.2	9.3	0.8	0.2
E48	63.4	0.9	0.3	37.7	1.0	0.4
Total Probable	83.3	0.8	0.3	47.0	1.0	0.4

Note – Resource Estimate

As required by the Australian Stock Exchange, the above table contains details of other mineralisation that has a reasonable prospect of being economically extracted in the future but which is not yet classified as Proven or Probable Reserves. This material is defined as Mineral Resources under the JORC Code. Estimates of such material are based largely on geological information with only preliminary consideration of mining, economic and other factors. While in the judgement of the Competent Person there are realistic expectations that all or part of the Mineral Resources will eventually become Proven or Probable Reserves, there is no guarantee that this will occur as the result depends on further technical and economic studies and prevailing economic conditions in the future.

Resources as stated are additional to the reserves reported in the table. The information in this report that relates to Exploration Results, Mineral Resources or Ore Reserves is based on information compiled by Andrew Lye, who is a member of the Australasian Institute of Geoscientists and is full-time employee of the company. Andrew Lye has sufficient experience which is relevant to the style of mineralisation and the type of deposit under consideration, and to the activity which they are undertaking to qualify as Competent Persons as defined in the 2004 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Andrew Lye consents to the inclusion in the report of the matters based on their information in the form and context in which it appears.

Strategic planning undertaken by NPM has identified a range of opportunities to add to the life of the mine. This has been reflected in the increase in reserves predominantly through the application of a declining shut-off grade policy for the E26 and E48 reserves. A declining shutoff policy ensures the highest grade ore available at any point in time is drawn from the cave for processing (assuming there are no other constraints on cave draw), and better utilises the resource base.

The addition of two extraction drives (ED9 & 10) to the E48 project, which increases the number of draw points from 170 to 214 draw points, has also added additional reserve to E48 and reduced technical risk associated with the project.

The increase in reserves extends mine life from 2018 to 2025 and also supports an increase in mill throughput and upgrades to existing infrastructure. Expansion of the production rate as outlined in this document will reduce overall unit costs and will enable further optimisation of shutoff grades and will add further incremental reserves pending approval of these modifications.

3.3. Tailings Management

3.3.1. Introduction

Comprehensive tailings strategies are in place at NPM to address operational and environmental aspects of tailings disposal. To date, all tailings from the processing of E22, E26 and E27 ore have been stored in Tailings Storage Facility (TSF) 1 and 2.

Approval has been received to construct the Rosedale TSF (TSF 3) and deposit tailings into the E27 opencut pit.

The increase in ore inventory almost directly translates to an increase in the required tailings storage volume. Processing of the increased ore inventory would result in the production of approximately 88 Mt of tailings. One additional TSF is proposed to provide sufficient capacity for the storage of these tailings, namely Estcourt TSF (TSF 4).

3.3.2. Tailings Characterisation

It is expected that the tailings to be deposited in the Estcourt TSF will have a similar composition to the tailings currently deposited in TSF1 and TSF2.

3.3.3. Tailings Storage Facility Design, Construction and Operation[5]

The Estcourt TSF disturbance area is shown above in Figure 5. The Estcourt Borrow Pit, an outcrop of weathered rocks north of the E27 Pit, has been a source of construction materials for TSF 1 and TSF 2.

Tailings deposition will initially occur in the already approved E27 pit prior to deposition in the Estcourt TSF. The E27 Pit has been mined out and use of the pit for the storage of tailings will eliminate the void. The estimated storage capacity of the Estcourt TSF (including E27 pit) is summarised in Table 8 below.

Table 8 Estimated storage capacity of Estcourt TSF

Component	Capacity (Mt)
E27 open pit (already approved)	18.1
Estcourt TSF (Stages 1 to 4)	24.2
Total Storage Capacity	**42.3**

It is anticipated that E27 will be filled to the pit rim with tailings prior to deposition in the wider Estcourt basin. Tailings will be cycled between E27, TSF 1 and TSF 2 to optimise the settling and consolidation of the deposited tailings as well as extending the life of the current structures.

An environmental containment trench will be excavated around the northern and western perimeter of the project site, prior to work commencing in the Estcourt TSF area. This trench will act to collect runoff from the works area. It will then be delivered to a retention pond formed by the northern part of the Estcourt Borrow pit. Water trapped in this retention pond may be pumped out on an as needs basis as is current practice with other retention ponds on site.

The construction of the Estcourt TSF will involve the construction of northern, eastern and southern embankments (Figure 6) at a downslope gradient of 1:3 and a final

[5] Knight Piésold Pty Ltd (2008), *Northparkes Mines Tailings Management Feasibility Study: Life of Mine Tailings Storage*, Ref.:PE801-00008/8

height of approximately 25 m above the natural ground level. The northern embankment will link the W2 dump to the northern side of the E27 pit. This embankment will be constructed with a composite of waste rock from the current open cut mining operation and clay oxide material. The eastern embankment will link the W1 dump and the western wall of TSF1, whilst the southern embankment will be constructed around the south of the E27 open pit, linking the W1 and W2 waste dumps. A section of the W1 waste dump to the north of E27 would be removed and the soils and waste rock would be potentially used in the rehabilitation of TSF 1 and TSF 2 or as construction material. Once filled, the tailings surface would slope from the north to the south, with decant and spillway facilities in the south-western corner.

Use of downstream construction methods for the southern embankment will allow construction of an emergency spillway at each stage. Thus, the environmental containment requirements as set by the Dam Safety Committee will dictate the minimum freeboard. The minimum freeboard as per NPM site standards will be for a 1 in 100 year 72 hr duration rainfall event. Runoff from storms of lower probability than that specified for environmental containment will be routed through the spillway. It is anticipated that discharge from the spillway will be directed into E22.

Water will be recovered from the Estcourt TSF during routine operations by pumping. It is expected that a skid mounted centrifugal pump will be used. Recovered water will be pumped directly to the process water dam.

The downstream faces of the northern, southern and eastern embankments will have uniform slopes without benches. The tailings surface will be stabilised, and the area covered with suitable waste rock and soil materials.

Settlement of the surface of the tailings over E27 is expected to continue for many years following closure. However, as the surface will be some distance above natural ground level it should be possible at any future stage to reshape parts of the southern embankment if required so that runoff can drain from the depression.

3.3.4. Existing Tailings Storage Facilities

It is expected that the tailings surfaces of TSF 1, TSF 2 and TSF 3 will be reshaped using tailings that have been discharged as slurry and the area covered with suitable waste rock and soil materials. The outer slopes of the confining embankments would be constructed to stable slopes. Runoff from these facilities will be harvested in such a way so as to protect the embankments from erosion.

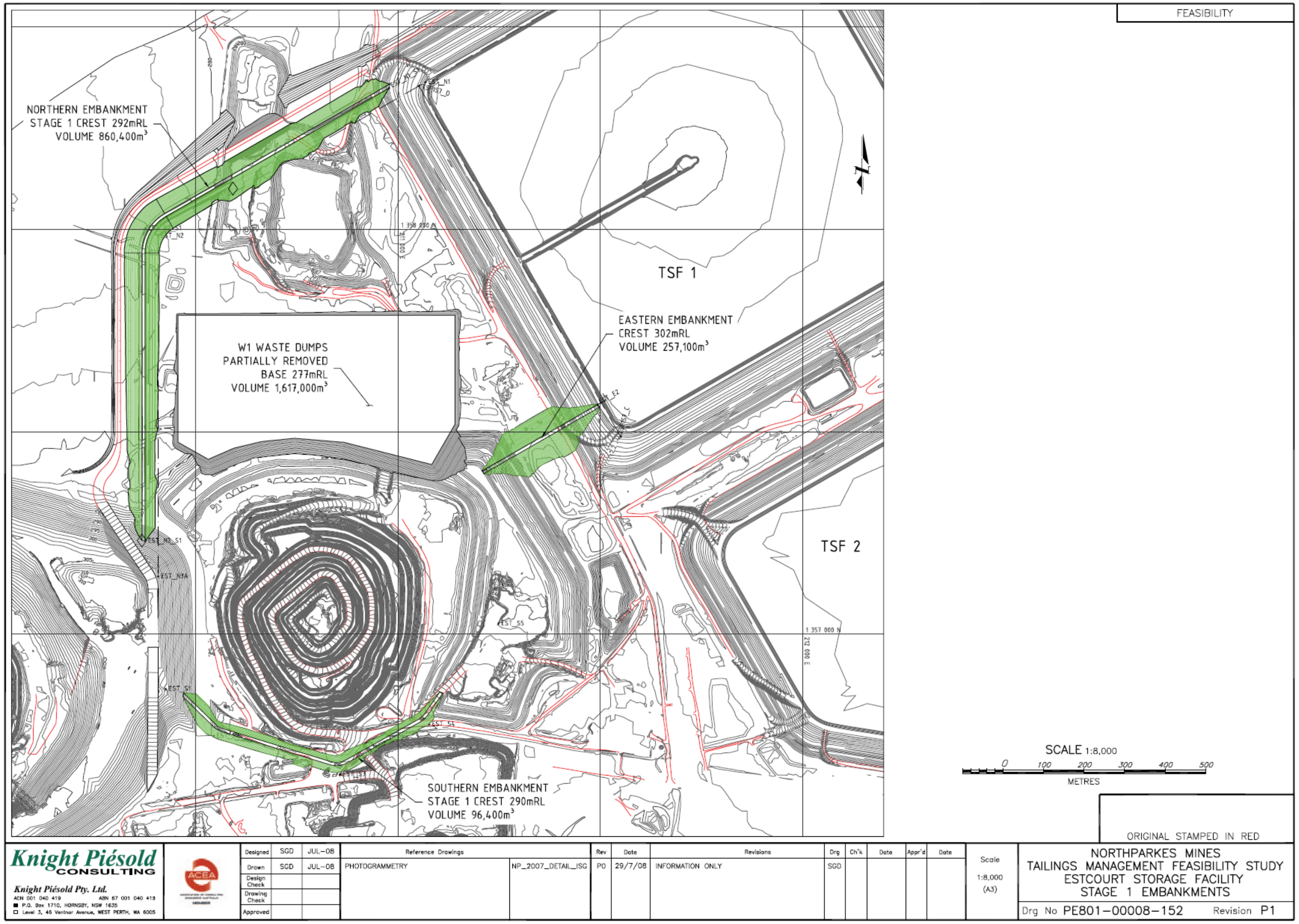


Figure 6 Estcourt TSF Stage 1

3.4. Ore Processing

3.4.1. Introduction

The capacity of NPM's current ore processing circuit is limited by its grinding and classification circuits, which cap throughput at 5.8Mtpa. Lower throughput rates are expected for open cut ores because open cut ore is harder and generally of a coarser feed size, which is attributed to the less efficient surface crushing facilities. In addition, E48 ore, which constitutes two thirds of the future ore to be processed, is known to have finer ore mineralogy. As a result, metal recoveries are expected to be lower than for E26 ores and copper concentrate grades are also expected to be lower. An increase in grinding capacity is required to increase recovery from E48 ores to a level comparable to that historically achieved from E26 and open cut ores.

NPM currently has reserves which will support a mine life extension to 2025, assuming throughput rate of 5.8Mtpa. The average grade of ore to be processed over this mine life is 0.8%Cu and 0.3g/t Au, which is lower than historical production. NPM is seeking to offset these lower feed grades by increasing throughput to 8.5 Mtpa.

To increase throughput the existing processing plant will require upgrades that include:

- A secondary and tertiary crusher (installed at the underground surface operations);
- Addition of a conveyor between the crushers;
- An upgrade of Module 1 and Module 2 grinding circuits;
- An upgrade of Module 1 and Module 2 flotation circuits;
- Construction of Module 3 flotation circuit;
- An upgrade of the concentrate handling facilities; and
- An upgrade of the tailings handling facilities.

Each of these modifications is discussed in further detail in the following sections.

3.4.2. Processing Plant Upgrades

NPM intend to process the increased volume of ore at an accelerated rate to maximise economic returns. To achieve this, the upgrades to the processing plant, as summarised in Table 9, Table 10 and Table 11 will be required. It is noted that:

- The upgrades to the grinding circuits of Modules 1 and 2 will be bounded by existing facilities;
- The upgrades to the flotation circuits of Modules 1 and 2 will be bounded by existing facilities;
- The Module 3 flotation circuit will be located in a new building adjacent to the existing processing building and within the existing facility's footprint;
- The upgrade to the concentrate handling facility will be bounded by existing facilities;

- The upgrade to thickener and pumps associated with the tailings handling facility will be bounded by existing facilities, however the associated piping will be additional to the existing facilities; and
- Optimisation and minor upgrade of the underground material handling systems, including the hoisting shaft, will be undertaken to maximise hoisting capacity to meet ore processing demand.

Table 9 Upgrades required for Module 1 and Module 2 Grinding Circuits

Module 1 Grinding Circuit	Module 2 Grinding Circuit
Conveyors	Conveyor
Screens	Ball Mill
Cyclones	Crusher
Instrumentation	Screens
	Pumps
	Cyclones
	Hoppers
	Instrumentation
	Piping
	Buildings
	Building Services
	Electrical Systems (minus HV supply)
	HV Supply
	Control System (other)

Table 10 Upgrades to Module 1, Module 2 and Module 3 Flotation Circuits

Module 1 Flotation Circuit	Module 2 Flotation Circuit	Module 3 Flotation Circuit
Flotation Cell	Cyclones	Pumps
Instrumentation	Flotation cells	Flotation Cells
Piping	Hopper	Hopper
Buildings (minus overhead crane)	Instrumentation	Verti Mill
Building services	Piping	Blowers

Module 1 Flotation Circuit	Module 2 Flotation Circuit	Module 3 Flotation Circuit
Electrical Systems (minus HV supply)	Buildings (minus overhead crane)	Instrumentation
Control Systems	Building services	Piping
	Electrical systems (minus HV supply)	Buildings (minus overhead crane)
	Control System	Overhead Crane
		Building services
		Electrical systems (minus HV supply)
		Control system

Table 11 Upgrades to concentrate and tailings handling facilities and additional works

Concentrate Handling	Tailings	Additional
Pumps	Thickener	Secondary and tertiary crusher
Hoppers	Pumps	Conveyor extension
Screens	Piping	
Tanks		
Filter		
Compressor		
Infrastructure (modifying entry and bunded storage area)		
Piping		
Building Services		
Electrical Systems (minus HV supply)		
Control system		

3.5. Transportation

3.5.1. Road Networks

External Road Network

There would be no change to the external road network or site access during the remaining life of the NPM operations arising from the proposed modification.

Internal Road Network

The internal road network would change slightly to provide access to the Estcourt TSF, between the proposed TSF components and the existing facility. Existing access and traffic management procedures would continue to be implemented over the life of the proposed operation to ensure all traffic on site interacts safely.

3.5.2. Traffic Types and Traffic Levels

Construction Period

During the construction of the Estcourt TSF and the upgrade of the ore processing plant, traffic travelling to and from the Project Site would increase due to the presence of contractors and the delivery of equipment and materials. Once construction activities cease, traffic levels would return to levels similar to normal operating levels. Major contractors may use small buses (e.g. 22 seater) and some car-pooling is likely. The bulk of the light vehicle traffic during the construction period would occur during shift changes, typically for a 1 hour period from 6.00 am to 7.00 am and 6.00 pm and 7.00 pm.

Heavy traffic would generally access the Project Site from Parkes, via Bogan Road. Light vehicles would also use Bogan Road and other local roads.

Product Transportation

Product transportation would not alter substantially from the existing transport regime.

3.6. Development Timetable, Hours of Operation and Project Life

3.6.1. Development Timetable

The indicative development and operational timetable for the project is presented in Table 12 below. The construction phase would be in the order of 48 months. Note that timeframes are approximate and will depend on the date of approval and potential mine planning variations.

Table 12 Development Timetable

Modification	Construction period (Months)	Estimated commission date
Estcourt TSF construction	8	January 2011

Increase to 8.5 Mtpa ore processed	NA	NA
Extend life of mine to 2025	NA	NA
Secondary Crusher installation	6	September 2010
Tertiary Crusher installation	6	July 2011
Processing infrastructure upgrades and modifications	48	January 2012

3.6.2. Hours of Operation

The project would operate within the same hours of operation as the existing NPM operations.

3.6.3. Project Life

Northparkes reserves will support mining operations until 2025.

3.7. Site Rehabilitation and Final Land Use

3.7.1. Introduction

Rehabilitation at NPM is managed under the Landscape Management Plan (LMP) that incorporates mine closure, final void management and rehabilitation activities for the operations.

Rehabilitation of the surface disturbance occurring as a result of the proposed modifications would be undertaken in accordance with the LMP and with commitments and strategies outlined in the Mining Operations Plan.

A detailed Mine Closure plan will be prepared in consultation with relevant stakeholders at least three years before the end of mine life.

Final Landform and Land Use

The site is currently divided into five land zones, which are considered to have their own unique end land use constraints and/or bias, as follows:

- Zone 1 – Former infrastructure and industrial areas (hardstand);
- Zone 2 – Final voids (subsidence zones/open cuts);
- Zone 3 – Former waste dumps and tailings storage facilities;
- Zone 4 – Unmined/cleared land, including buffer land (farmland); and
- Zone 5 – Undisturbed land.

The preferred post closure land use options that have been preliminary determined as a result of the mine closure strategy detailed in the LMP were:

- Nature Reserve consisting of native habitat to promote biodiversity (Zones 1, 2, 3, and 5); and
- Agriculture that may include cropping/grazing (Zone 4).

This modification will result in minor changes to the conceptual final landforms and areas of final land use as provided in **Figure 7**. However the management practices and controls detailed in the LMP to manage the structures and features of each area will not change as a result of the proposed modification.

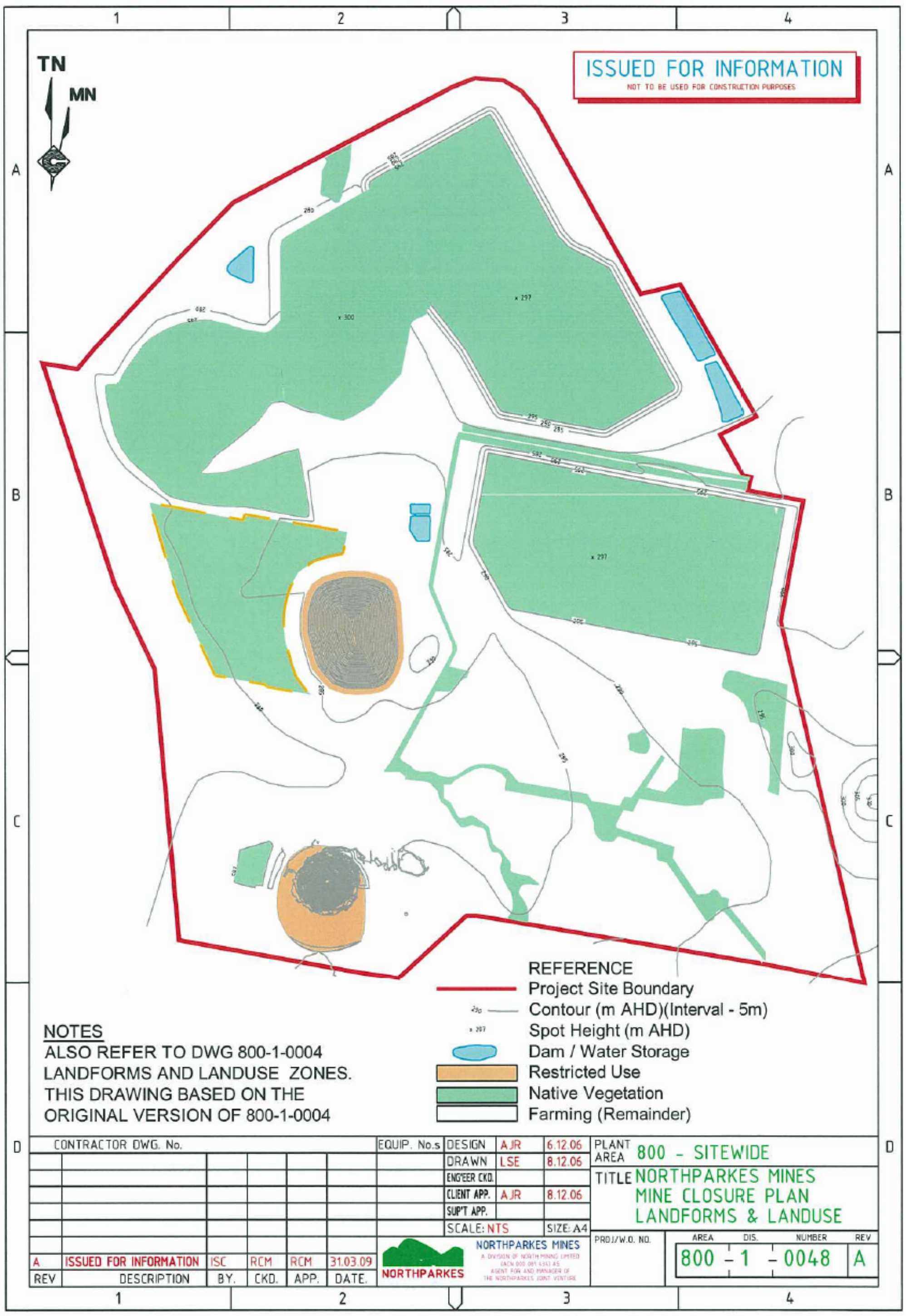


Figure 7 Conceptual Final Landforms and Areas of Final Land Use

4. Consultation, Issue Identification and risk analysis

4.1. Consultation

The Director General's Requirements (DGRs) received from the Department of Planning (DoP) required NPM to undertake an 'appropriate level of consultation for the proposed modification'.

4.1.1. Government Consultation

In late 2008, GHD and NPM staff met with DWE, DSC, DPI (MR), DECC, Parkes and Forbes Shire Councils to discuss the proposed modification.

Written correspondence was subsequently received from DECC, DWE and DPI (MR). This correspondence has been used to guide the assessment. The DGRs and agency correspondence are presented in Appendix A.

4.1.2. The Director General's Environmental Assessment Requirements

On 26 September 2008, the NSW DoP issued its DGRs for the Section 75W modification.

The DGRs listed the general requirements as shown in Table 13.

Table 13 Director General Requirements

DGR	Where addressed in this EA
A summary of the existing and approved mining operations, including any relevant statutory approvals, and the existing environmental management and monitoring regime at the mine	Chapters 1, 2, 3
A detailed description and justification of the proposed modification	Chapters 3 and 7
A risk assessment of the potential environmental impacts of the proposed modification, identifying the key issues for further assessment including:	Chapter 4

DGR	Where addressed in this EA
A detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes: ◗ A description of the existing environment ◗ As assessment of the potential impacts of the proposed modification, including any cumulative impacts, taking into consideration any relevant guidelines, policies, plans and statutory provisions (see below) ◗ A description of the measures that would be implemented to avoid, minimise, mitigate, rehabilitate/remediate, monitor and/or offset the potential impacts of the proposed modification	Chapter 5
Key issues addressed include:	
◗ Soil and Water;	Sections 5.3, 5.5, 5.6 and 5.7
◗ Biodiversity;	5.9
◗ Noise and Vibration;	5.2
◗ Air Quality;	5.4
◗ Transport;	5.8
◗ Aboriginal Heritage; and	5.11
◗ Rehabilitation.	Throughout document
A statement of commitments, outlining all the proposed environmental management and monitoring measures	Chapter 6
A conclusion justifying the proposed modification on economic, social and environmental grounds, taking into consideration whether the proposed modification is consistent with the objects of the Environmental Planning & Assessment Act 1979	Chapter 7, Section 7.4
A signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading	Preface, Page i

DGR	Where addressed in this EA
During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth government authorities, service providers, community groups or affected landowners. In particular, you should consult with: ◗ Parkes and Forbes Shire Councils; ◗ Department of Environment and Climate Change; ◗ Department of Primary Industries; ◗ Department of Water and Energy; ◗ Dams Safety Committee; and ◗ Northparkes Community Consultative Committee The consultation process and the issues raised must be described in the Environmental Assessment.	Chapter 4

4.1.3.Community and Landowner Consultation

The community and landowners were informed of the modification through use of NPM's ongoing community liaison process. No landowners are directly affected by the proposal, as North Mining Limited wholly owns the land upon which the modification will be based. Further input from the community will be sought through the exhibition process.

Consultation with the local Wiradjuri community on the proposed modification and aboriginal heritage assessment was undertaken through Aboriginal Heritage Working Group (AHWG) meetings held on 27 October 2008 and 12 December 2008.

Consultation with the Southern Cross Landowners (SCL) on the proposed modification was undertaken through the Parkes Borefield Community Consultation Committee meeting held on 21 November 2008. The Committee consists of PSC, SCL and NPM representatives.

4.1.4.Public Exhibition and Submissions Report

The Environmental Assessment Report will be exhibited for approximately two weeks as required by DoP. Prior to exhibition North Mining Limited will release an advertisement and press release advising of the exhibition.

During the assessment of the proposal and Environmental Assessment Report there may be a need to respond to technical issues raised by DoP, other agencies and the community. This may include the need to prepare a submissions report (depending on the number and nature of submissions received).

4.2. Relevant Planning Instruments and Guidelines

4.2.1. Introduction

There are no Regional Environmental Plans relevant to the Project. As previously noted, mining is a permissible use within the Project Site under Parkes Local Environmental Plan 1990.

4.2.2. State Planning Instruments

State Environmental Planning Policy (Major Projects) 2005

SEPP Major Projects was gazetted on 25 May 2005 and applies to all projects satisfying nominated criteria made following this date. The aims of this Policy are:

"(a) to identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development;

(b) to facilitate the development, redevelopment or protection of important urban, coastal and regional sites of economic, environmental or social significance to the State so as to facilitate the orderly use, development or conservation of those State significant sites for the benefit of the State;

(c) to facilitate service delivery outcomes for a range of public services and to provide for the development of major sites for a public purpose or redevelopment of major sites no longer appropriate or suitable for public purposes; and

(d) to rationalise and clarify the provisions making the Minister the consent authority for State significant development and State significant sites and to keep those provisions under review so that the consent powers are devolved to councils when the State planning objectives have been achieved."

As identified in Schedule 1 for Part 3A projects, the E48 Project is classified as a Group 2 development, i.e. mining, petroleum production, extractive industries and related industries. As such, the planning approval application for the Project will be assessed through the Part 3A process of the *Environmental Planning and Assessment Act 1979*.

State Environmental Planning Policy No. 11 (SEPP 11) – Traffic Generating Developments

Clause 7 of SEPP 11 requires that certain potentially traffic generating development applications be referred to the NSW Roads and Traffic Authority (RTA). Mining is listed under paragraph (m), Schedule 1 of this policy, and hence this Project must therefore be referred to the RTA.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

Hazardous materials are defined within DUAP now Department of Planning (1997) as substances falling within the classification of the *Australian Code for Transportation of Dangerous Goods by Road and Rail* (Dangerous Goods Code).

Based on the risk screening method of DUAP, neither the storage nor transport of the hazardous materials to be stored under the project as modified would result in the Project being considered potentially hazardous under SEPP 33. As such, there is no requirement to undertake a Preliminary Hazard Analysis for the Project.

State Environmental Planning Policy No. 44 (SEPP 44) - Koala Habitat Protection

The findings of the E48 EA were summarised as follows[6]:

Parkes Local Government Area (LGA) is identified in Schedule 1 of this policy as an area that could provide habitat for Koalas. The policy requires an investigation be carried out to determine if core or potential Koala habitat is present on the Project Site and likely to be disturbed. Core Koala habitat comprises land with an identified resident population of Koalas while potential Koala habitat comprises land with native vegetation with known Koala feed trees constituting at least 15% of the total number of trees present on a site. The ecological assessment (*Specialist Consultant Studies Compendium* - Part 7) determined that the Project Site contained two species of Koala feed trees, namely Bimble Box (*Eucalyptus populnea*) and White Box (*Eucalyptus albens*). These species were found to comprise less than 15% of the total number of trees within the areas to be cleared. As such, it was concluded that the Project Site does not contain 'core' or 'potential' Koala habitat; hence this SEPP has not been considered further.

For the proposed modification GHD carried out an ecological assessment (Chapter 5). The findings with respect to SEPP 44 were that it also did not apply in this case.

State Environmental Planning Policy No. 55 – Remediation of Land

SEPP 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. In particular, this policy states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed.

The existing and proposed tailings storage facilities are considered contaminated land. This SEPP requires the consent authority to consider whether, if land is contaminated, it is suitable in this contaminated state for the proposed development. The existing TSF 1 and TSF 2 provide tailings containment to the satisfaction of the NSW Dam Safety Committee. The proposed Estcourt TSF will also be constructed to the satisfaction of the NSW Dam Safety Committee and will be constructed on uncontaminated land. As such, the land is considered suitable for the proposed development.

4.3. Issue Identification and General Environmental Risk Analysis

The potential environmental impacts of the project were identified based on the following activities:

- Review of the E48 Environmental Assessment;

[6] Corkery and Associates (2006)

- Database searches for heritage and flora and fauna;
- Inspection of the site and surrounding land uses to ascertain the nature of the existing environment;
- Review of the proposed modification layouts and the proposed processes; and
- Consideration of the issues raised by the community and stakeholders historically and during the preparation of this EA.

The issues identified were then submitted in the meeting between DoP and the proponent resulting in DGRs listing key issues as follows:

- Soil and Water;
- Biodiversity;
- Noise and Vibration;
- Air Quality;
- Transport;
- Aboriginal Heritage; and
- Rehabilitation.

The prioritisation of issues is based on the need to recognise that the higher the potential severity of adverse environmental effects and the greater the consequence of those unmanaged effects, the higher the degree of assessment required.

The potential impacts of the proposal in relation to each of these issues and proposed mitigation and management measures are addressed accordingly in Chapter 5 and in the Statement of Commitments in Chapter 6.

5. Existing environment, management and impacts

5.1. Preamble

Chapter 5 of this Environmental Assessment (EA) presents impact assessments following the same Table of Contents as the original E48 Environmental Assessment (Corkery and Associates, 2006).

5.2. Noise and Vibration

A noise and vibration assessment of the modification was undertaken by GHD. This part provides a summary of the noise and vibration assessment report presented in full in Appendix B.

5.2.1. Introduction

The noise impact assessment has been conducted with consideration to the following NSW Department of Environment and Climate Change (DECC) Noise Policies:

- Industrial Noise Policy (INP);
- Environmental Noise Control Manual (ENCM), Chapter 19; and
- New South Wales Construction Noise Guidelines: Draft for consultation (August 2008).

Noise Goals

The DECC construction noise criteria are calculated based on the adopted rating background level (RBL) at nearby residential locations (Figure 8). In the absence of long-term unattended background noise monitoring data, without noise contribution from the existing NPM site, DECC's INP minimum recommended RBL of 30 dB(A) was adopted for the purposes of this assessment.

5.2.2. E48 Impact Assessment Outcome

The Northparkes Mine – E48 Project Noise and Blasting Assessment prepared by Heggies (August, 2006) forms the basis of this assessment and is hereafter referred to as the 'Heggies report'.

The Heggies report concluded that:

- 'With the exception of the predicted noise levels at [the unoccupied residence] "Avondale", particularly under inversion conditions, noise from the [Rosedale] TSF construction activities would generally be compliant with the 35 dB(A) criterion at other surrounding residences.'
- 'The E48 Project-related operations would not be audible during the day at the surrounding residences, as is predominantly the case at present. It is, however, possible that operational noise may be discernible of an evening and night under

adverse weather conditions, although the levels to be experienced would be less than or equal to the 35 dB(A) criterion.'

- 'During [on-site blast and vibration monitoring], airblast overpressure levels varied from <104.7 dB linear to 113.9 dB linear and ground vibration levels varied from 0.2 mm/sec to 0.44 mm/sec. In all cases, the monitored effects were compliant with the [licence] criteria…. Based on this level of compliance, ongoing compliance with the blasts in the E22 open cut mine is highly likely.'

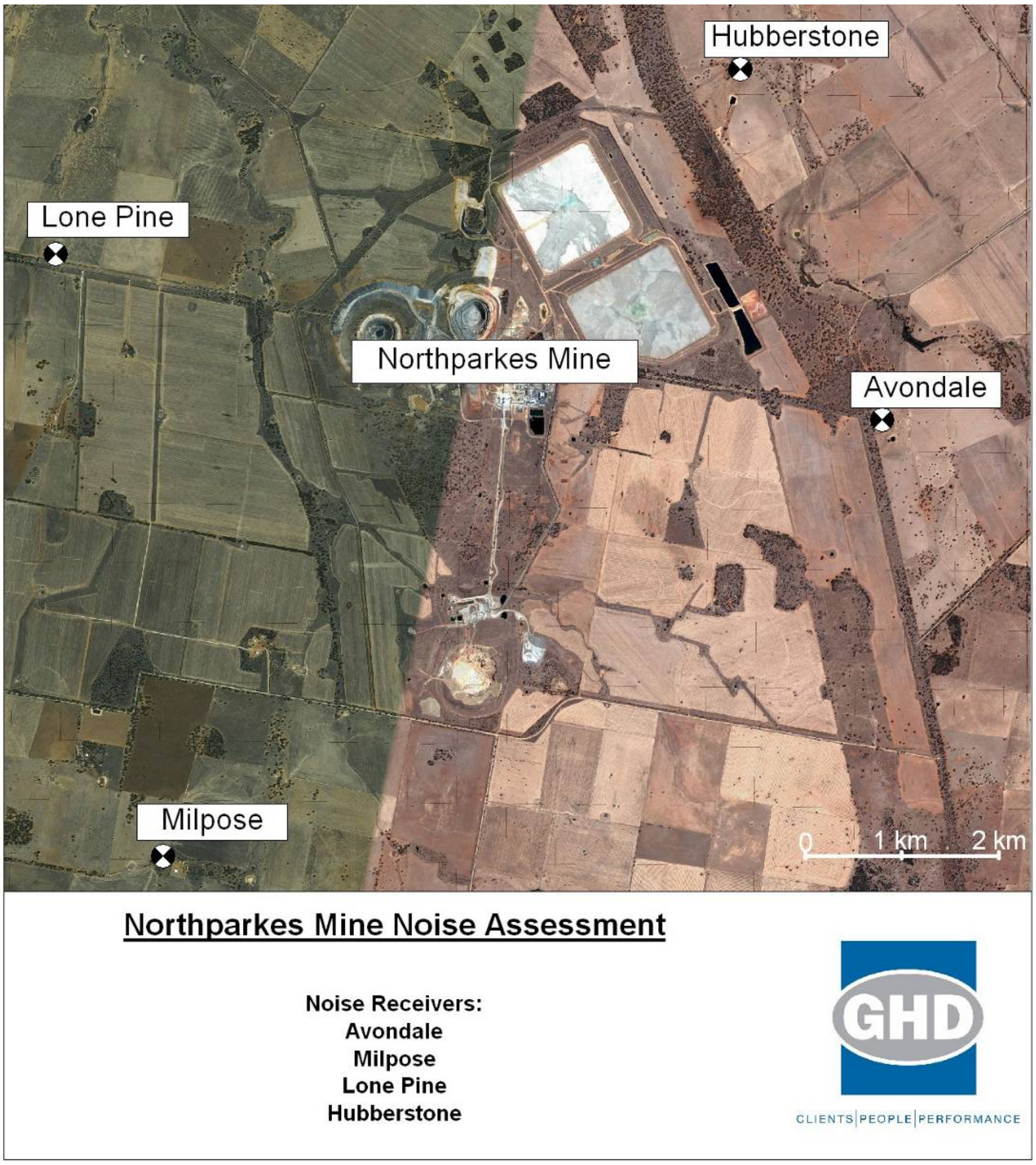


Figure 8 NPM Noise Receivers

5.2.3.Methodology for Modification Assessment

The scope of work of the noise impact assessment for the purposes of the modification was as follows:

- Initial desk-top review to identify key environmental noise catchment areas and noise sensitive receivers from aerial & terrestrial photography and previous NPM noise and vibration reports;
- Provision of a summary of the results of ambient noise monitoring recently conducted at residential locations surrounding NPM by Heggies Australia Pty Ltd (Heggies)[7];
- Identification of the principal noise sources within the existing NPM site and develop a noise model of the existing mining operations. This noise model was verified using Heggies noise monitoring data and noise predictions;
- Identification of the future noise sources proposed as part of the approval modification;
- Conducting noise modelling of two operational scenarios to account for different meteorological conditions (neutral and noise enhancing weather conditions) using Cadna-A noise modelling software to predict operational sound pressure levels emanating from the mine with the proposed approval modifications. Noise modelling was undertaken with consideration to the DECC NSW *Industrial Noise Policy* (INP);
- Assessment of predicted noise levels against NPM Specific Environmental Conditions of DC 06-0026 and the Proponent's Statement of Commitments;
- Provide recommendations for in-principle noise mitigation measures have been made;
- Desktop assessment to predict blasting overpressure and vibration levels at identified receivers. Blasting overpressure and vibration level predictions were based on previous predictions made by Heggies[8];
- Identification and discussion of vibration issues at the most sensitive receivers and provision of in-principle advice on potential site vibration related issues; and
- Predictions of potential increases in road traffic noise using the Calculation of Road Traffic Noise (CoRTN) model with consideration to the DECC's *Environmental Criteria for Road Traffic Noise* (ECRTN).

5.2.4. Modification Impact Assessment

Operational Noise

Predicted noise levels from the NPM operations following the proposed modifications show that the license limit of 35 dB(A) is expected to be met at all noise receivers under the modelled weather conditions.

A comparison of predicted noise results following the modifications to the existing mining operations show increases in noise levels of up to 4 dB(A) at the nearest

[7] Heggies Australia Limited, Northparkes Mines Mine Operation Noise Monitoring, September 2008.

[8] Heggies Australia Pty Ltd, Noise and Blasting Assessment of the Northparkes Mines – E48 Project, August 2006.

receivers, however remaining within the 35 dB(A) noise goal. These increases are primarily experienced at receivers ‘Milpose’ and ‘Lone Pine’ and can be mainly attributed to the re-alignment of the overland conveyor and addition of the secondary and tertiary crushers near the underground mine portal area.

Estcourt TSF Construction Noise

Noise levels during the construction of the Estcourt TSF show a potential 1 dB(A) exceedance of the nighttime noise goal at ‘Lone Pine’ receiver, while noise levels at all other receivers are shown to comply under all modelled weather conditions. As a result of the potential exceedance, general recommendations for noise mitigation measures have been outlined in Section 5.2.5.

Predicted cumulative noise impacts from the proposed operations and construction of Estcourt TSF suggest compliance with the license noise limit of 35 dB(A) under all weather conditions at ‘Hubberstone’, ‘Avondale’ and ‘Milpose’. However, model results suggest a potential exceedance of up to 3 dB(A) above the nighttime noise goal at ‘Lone Pine’ receiver under weather enhancing conditions.

Road traffic noise

Based on the predicted minor increase in truck movements associated with the proposed increase in ore production, it is not expected that significant traffic noise impact on the local road network would occur.

Sleep disturbance

Maximum received noise levels due to track dozer operation are expected to be under the 45 dB(A)L_1 sleep disturbance criteria at all identified receivers.

Blasting impacts

Predicted ground vibration and airblast levels were assessed at the identified receivers and are presented in Section 5 of the full noise and vibration assessment presented in Appendix B. It is anticipated the ongoing open cut and underground operations should not cause adverse impacts resulting from blasting.

5.2.5. Mitigation Measures and Safeguards

Based on the information provided, assumptions made and the results of the assessment, it is considered that project specific noise goals can be achieved at the nearest potentially affected receivers based on the proposed mining operations. However, there is potential exceedance of the noise goals during construction of “Estcourt” TSF under adverse weather conditions. Recommended mitigation measures to minimise construction noise during these conditions are summarised below.

As far as practicable, the following general noise control measures should be incorporated in the construction environmental management plan (CEMP) for the Estcourt TSF:

- All site personnel should be made aware of the potential for noise impacts onto local residents and encouraged to take all practical and reasonable measures to minimise noise during the course of their activities; and
- An NPM representative (as appropriate) should establish contact with the local residents and communicate the construction program and progress on a regular basis.
- Review available fixed and mobile equipment fleet and fit with low pitch reversing beepers and sound attenuation mufflers, wherever possible. In any case, all equipment used on site should be in good condition and good working order;
- Plan to use equipment appropriate for the required tasks in terms of power requirements;
- Engine covers should be kept closed while equipment is operating;
- As far as possible, materials dropping from heights into or out of trucks should be minimised;
- Vehicles should be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable;
- Where practical, machines should be switched off when not being used rather than left idling for prolonged periods; and
- Machines found to produce abnormally high noise should be removed from the site or stood down until repairs or modifications can be made.

More detail is provided in Section 6 of the full noise and vibration assessment presented in Appendix B.

5.3. Soils

5.3.1.Introduction

Geoff Cunningham Natural Resource Consultants (2006) identified two naturally occurring Soil Mapping Units (SMUs) across the Project Site, with SMU1 largely associated with soils on slightly elevated areas of topography and SMU2 associated with mid and lower slopes, level plains and drainage depressions (Table 14 and Figure 9). Two further highly modified SMUs were identified during field surveys for the proposed modification: overburden stockpiles and topsoil stockpiles. These two units were identified as a guide to the assessment of native vegetation and habitat.

Table 14 Description of soil mapping units at Northparkes Mines[9]

Soil Unit	SMU1	SMU2	Overburden stockpiles	Soil stockpiles
Soil profile	To 88 cm deep, firm to hardsetting surface.	To 280 cm deep, firm to self-mulching surface, sometimes loose, soft or hardsetting.	To 20 m deep. Firm to hardsetting surface. Silty clay to heavy clay. Local surface erosion. Abundant gravel and stones. Few roots.	To approx 150 cm deep, firm to hardsetting surface. Loam to silty clay. Little surface erosion. Many roots present.
Topsoil	Loam sandy clay loam or clay loam, no gypsum, lime or manganese present, pH 5.0 to 7.0, many roots present, some grave and stone, highly pedal, consistency dry and usually hydrophobic.	Silty clay to heavy clay, roots common, no lime, gypsum or manganese present, pH 5.0 to 6.0 (occasionally outside this range), no gravel or stones, highly pedal, firm to strong consistency dry and sometimes hydrophobic.	Not applicable.	Not applicable.
Subsoil	Two subsoil horizons evident, texture becomes increasingly clayey with depth, sandy light clay to heavy clay, some roots present, no lime or gypsum present, some manganese at depth, some gravel, pH	Up to five distinct horizons, clay texture throughout with horizons sometimes becoming gritty near bedrock, usually highly pedal, mottles increase with depth.	Not applicable.	Not applicable.

[9] Source: Corkery and Associates (2006)

Soil Unit	SMU1	SMU2	Overburden stockpiles	Soil stockpiles
	5.5 to 7.5, highly pedal or massive, very firm to strong, consistency dry, usually not hydrophobic.			
Vegetation	Box woodland, Native grassland or dense low shrub land or grassland dominated by exotic environmental weeds.	Small area of Box woodland in north of site -remainder - Wheat crop or dense low shrub land or grassland dominated by exotic environmental weeds.	Very sparse cover of exotic plants. Mainly bare earth.	Dense low shrub land or grassland dominated by exotic environmental weeds.

Source: Geoff Cunningham Natural Resource Consultants (2006); Corkery and Associates (2006)

Geoff Cunningham Natural Resource Consultants (2006) concluded that farming practices implemented across the NPM site such as soil conservation works, conservation tillage practices, stubble retention and an absence of livestock grazing, has helped to minimise erosion and has maintained NPM's farm land soils in a generally stable state. This was reaffirmed during the GHD (2008) field surveys, which noted minor, localised erosion in intact native vegetation, agricultural crops and topsoil stockpile areas.

NPM is located on the edge of the inland slopes beyond the Great Dividing Range. The surrounding landscape is generally flat with some low undulations ranging from 280m AHD to 300 m AHD, with some higher peaks. The most significant topographical features in the region are Goonumbla Hill (386 m AHD) located immediately south of NPM. NPM is located amongst relatively flat topography, with the significant topographic features of the NPM created through previous mining activity. The highest near-natural point of the NPM is 301 m AHD in the southeast, with topography reaching a low of 288 m AHD to the west. Topographic slopes from east to west range from 1:30 to 1:170 (V:H). Mining activities have created topographic highs in the form of TSFs and waste rock stockpiles and topographic lows formed by the two open cut mines (E22 and E27) and the E26 subsidence zone (Corkery and Associates, 2006).

The pits for the open cut and associated roads, TSFs, laydown areas, processing plant and overburden storage areas have extensively modified the local topography within the site for the proposed modifications. Areas of native vegetation remain on near-natural landscapes with mature trees and intact topsoil. The remainder of the site consists of highly modified landscapes covered by infrastructure, bare earth or exotic plants.

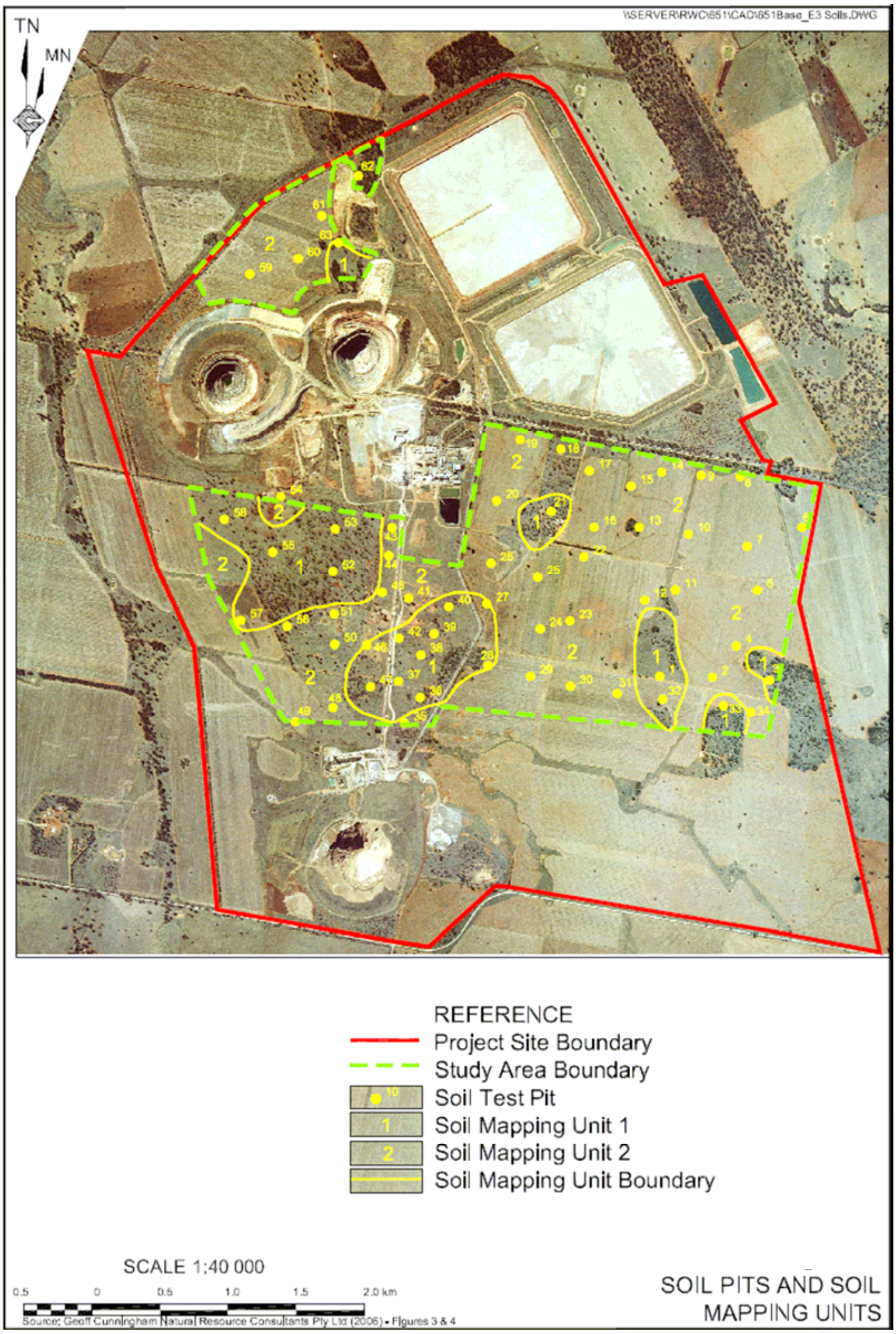


Figure 9 Soil Mapping Units[10]

[10] Source: Corkery and Associates (2006)

5.3.2.E48 Impact Assessment Outcome

The E48 EA concluded under soil impact assessment that:

> *The current farming practices implemented across much of the Project Site such as soil conservation works, conservation tillage practices, stubble retention and an absence of livestock grazing, has contributed to the absence of visible land degradation through erosion and has maintained the Project Site farm land soils in a generally stable state.*
>
> *While the stripping of the soils for the E48 Project components would result in a level of disturbance to the soil, the implementation of the management measures as detailed in Part E3.2 would result in this impact being minimised. Once the soils are replaced on the final landform, they should provide a suitable substrate for revegetation. As such, the impact to the soils within the disturbance area is considered temporary and manageable.*[11]

5.3.3.Methodology for Modification Assessment

Desktop analysis has been conducted for the proposed modification since the E48 soil mapping covered the relevant study area.

5.3.4.Modification Impact Assessment

Following on from the E48 conclusion it is considered that similar conclusions as noted above can be drawn subject to the same rigour in management, as has been the case. The mitigation measures included in the E48 work will need to be continued as detailed below.

5.3.5.Mitigation Measures and Safeguards

The E48 EA provided mitigation measures to maintain soil value for rehabilitation and minimise soil loss through erosion. No additional mitigation measures are proposed over those detailed in the E48 EA. These mitigation measures are outlined the Statement of Commitments in Section 6, Table 23.

5.4. Air Quality

5.4.1.Introduction

GHD undertook an air quality assessment of the potential impacts of the proposed modifications on the nearest sensitive receptors. The scope of work of the air quality assessment was to:

- Check that the construction activities associated with the proposed works would comply with required air quality criteria; and
- Check that the incremental increase to air emissions arising from the operation of the proposed works would still comply with the required air quality criteria.

[11] Corkery and Associates (2006)

The scope of work was conducted with consideration to the to the DECC *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2005).

5.4.2.E48 Impact Assessment Outcome

All modelling predictions indicated that, provided specific design and operational safeguards were implemented, particulate matter, dust deposition, NO_2 and SO_2 attributable to the E48 project and any future operation of the E22 open cut would be within the current DECC (NEPM) air quality goals at all surrounding residences (Heggies, 2006).

An air quality monitoring program has been implemented at the site to measure compliance against air quality criteria using both high volume air samplers and depositional dust gauges.

5.4.3.Methodology for Modification Assessment

The Northparkes Mines – E48 Project Air Quality Assessment prepared by Heggies Australia Pty Ltd (August, 2006) forms the basis of this assessment and is hereafter referred to as the 'Heggies report'.

In particular, the Heggies report assessed two scenarios:

1. *Scenario 1 (year 2008) – incorporates the development of the E48 Underground Mine including the stripping of the surface subsidence area, construction of the Tailings Storage Facility 3, work at the Rosedale Borrow Pit area and service corridor relocation. Additionally, processing plant operations have also been included as operation of the E26 Lift 2 is planned to extend to 2009; and*
2. *Scenario 2 (year 2012) – incorporates the production from the E48 Underground Mine, operation of Tailings Storage Facility 3, work at the Rosedale Borrow Pit and processing plant operations.*

The following assessment relies upon Scenario 1 to gauge construction air quality impacts and Scenario 2 to gauge operational air quality impacts.

Note that an annual production throughput of 5.5 Mt was assumed by Heggies in both scenarios.

5.4.4.Modification Impact Assessment

Construction

Construction of the Estcourt TSF consists of an earth wall from the north-west corner of TSF 1 along the north western boundary of the mine site and south to the E27 open cut pit.

The types of emissions to air during the construction process would primarily consist of dust emissions from both the mechanical disturbance and wind erosion of crustal material and exhaust emissions from the range of motor vehicle and mobile plant required for the project.

Approval for the construction of Estcourt TSF would delay the construction of TSF 3 (which was included as part of model Scenario 1).

The increment in air emissions attributable to the construction of the Estcourt TSF is not expected to significantly change the predicted levels of off-site impact for the following reasons:

- Standard mitigation measures would be applied to the Estcourt TSF construction emission sources as specified in the original conditions of consent for the construction of TSF 3;
- The proposed TSF is smaller in size and is located farther from the most exposed sensitive receptor[12] ("Avondale") than the TSF 3 assessed as part of Scenario 1; and
- Model predictions for Scenario 1 indicate that the air quality impact increment attributable to the E48 project represents a small fraction of the respective air quality criteria and as such the increment from the construction of the different TSF should not influence compliance.

Operation

The emission inventory used to assess the original E48 project was derived from the application of published emissions factors. Emission factors relate the quantity of substances emitted from a source to a common activity associated with those emissions and are generally expressed as the mass of the substance emitted per unit process weight, volume, distance or duration of the given mining/construction activity (e.g. truck unloading at a TSF). The scale of each activity is likely to be proportional to the total mine throughput.

The original E48 project was assessed on an annual production level of 5.5 Mt per annum. It is understood that that throughput may increase due to future works and demand to 8.5 Mt per annum (increase of approximately 55%). Therefore, it has been assumed that the increase in mining throughput directly translates to an increase in the estimated air emissions from the mine site of 55%.

The relationship between emission rate and the predicted ground level concentration is linear if all other discharge parameters remain constant. Hence, the pro-rata predicted ground level concentration at the most exposed sensitive receptor would be, at worst, directly proportional to the increase in the total NPM emission rate.

The pro-rata predicted ground level concentrations for Scenario 2 for each pollutant at the most exposed sensitive receptor (residence) are presented in Table 15.

[12] The residence with the highest predicted incremental increase in dust deposition and 24-hour PM10 concentrations is "Avondale" for both Scenario 1 and Scenario 2.

Table 15 Pro-Rata Predicted Ground Level Concentrations for Scenario 2

Pollutant	Units	Original Increment Attributed to the E48 Project	Pro-Rata Increment Attributed to the Modified E48 Project (6)	Back-ground	Back-Ground + Pro-Rata Increment	Air Quality Impact Criteria
Dust	g/m^2/month	0.6 (1)	0.9	2.7	3.6	4
PM_{10}	$\mu g/m^3$ (24-hr)	2.9 (2)	4.5	45.9	50.4	50
PM_{10}	$\mu g/m^3$ (annual)	1.3 (3)	2.0	17.6	19.6	30
SO_2	$\mu g/m^3$ (1-hr)	9 (4)	14	0	14	570
NO_2	$\mu g/m^3$ (1-hr)	116 (5)	180	0	180	246

(1) Taken from Heggies report, Table 10;

(2) Taken from Heggies report, Table 11;

(3) Taken from Heggies report, Table 13;

(4) Taken from Heggies report, Table 14;

(5) Taken from Heggies report, Table 15; and

(6) Original increment scaled by a factor of 1.55 (i.e. 55% increase).

Table 15 shows that the total impact (increment plus background) associated with the proposed works are predicted to be below the respective air quality criteria at the most exposed sensitive receptor, except for a marginal exceedance of the PM_{10} (24-hour average) criterion.

It is evident from the data presented in Table 15 that the predicted incremental PM_{10} impact is low, at less than 10% of the 24-hour PM_{10} criterion, and that the adopted background PM_{10} concentration comprises the bulk of the criterion. However, it should be noted that the highest predicted incremental increase in 24-hour average PM_{10} concentrations at the most exposed residence was 30 $\mu g/m^3$ (refer to Table 12 in the Heggies report), which translates into a pro-rata maximum incremental concentration of 46 $\mu g/m^3$, which is approximately 92% of the PM_{10} criterion in the worst case[13]. Hence, it is clear that the background PM_{10} concentration is the critical factor in determining compliance with the PM_{10} criterion.

[13] The second and third highest predicted increments were 28.4 and 23.3 $\mu g/m^3$ respectively. The remainder were less than 20 $\mu g/m^3$.

The time varying background PM_{10} data used in the Heggies report was not site specific but was considered, by Heggies, to be a conservative estimate of background PM_{10} levels in the vicinity of the mine site.

NPM has recently modified its air quality monitoring program to include PM_{10} monitoring at the location of local residences using high volume air samplers fitted with a size selective inlet to collect samples for 24 hours every sixth day. Preliminary data collected between March and September 2008 is presented in Figure 10. The mean 24-hour PM_{10} concentration is approximately 16 µg/m^3 and ranges from 4 to 75 µg/m^3, with three recorded exceedances of the PM_{10} criterion of 50 µg/m^3. Note that these measured PM_{10} concentrations include the potential contribution of particulate emissions from NPM operations.

GHD expect that a reasonable representation of the background PM_{10} 24-hour concentration levels (i.e. excluding the mine contribution) would be in the order of 5 – 15µg/m^3 for this type of rural environment. Hence, it is likely that the impact of PM_{10} emissions from proposed works would be below the PM_{10} criterion on a day-to-day basis, provided the specific design and operational safeguards documented in the Heggies report are implemented.

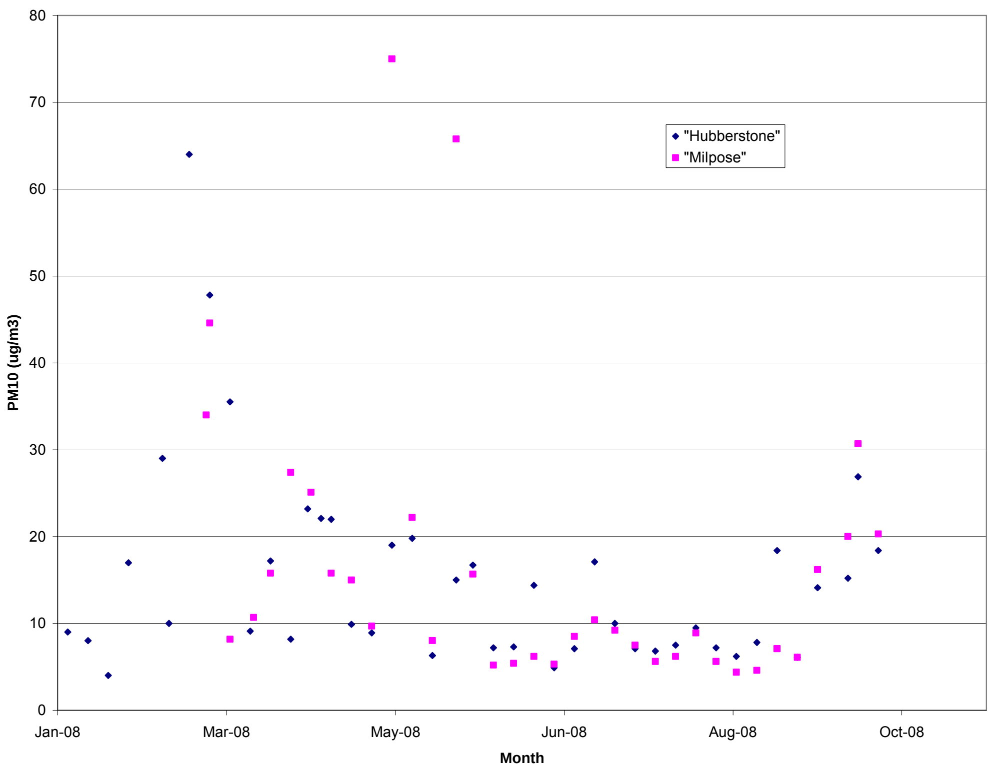


Figure 10 PM10 Monitoring results - January to October 2008

Conclusions

The proposed works, including construction activities, are expected to still comply with the required air quality criteria and management measures specified in the development consent and original Northparkes Mines – E48 Environmental Assessment report respectively, with the exception of compliance with the 24-hour PM_{10} criterion under 8.5 Mt throughput operations, which was determined to be marginal.

The 24-hour PM_{10} increment attributable to the proposed works was conservatively estimated to remain below the PM_{10} criterion in the worst case. However, in the assessment of total impact (increment plus background), it is clear that the specification of a representative background PM_{10} concentration is the critical factor in determining compliance with the PM_{10} criterion. If it is assumed that the background PM_{10} 24-hour concentration is in the order of 5 – 15µg/m^3 it is likely that the total impact of PM_{10} emissions from proposed works would be below the PM_{10} criterion on a day-to-day basis, provided the specific design and operational safeguards documented in the Heggies report are implemented.

5.4.5.Mitigation Measures and Safeguards

No additional mitigation measures are proposed over those detailed in the E48 EA. NPM will continue the existing program of air quality monitoring at various residences and locations around the site. Air quality monitoring results will be evaluated regularly to ensure the collected data is meaningful.

5.5. Surface Water Resources

5.5.1.Introduction

This section presents a description of the proposed modification's impact on surface water resource use and the water cycle at NPM.

In terms of regional surface water context, the Parkes area is drained by two major river systems, the Bogan-Macquarie and the Lachlan River systems, both of which are major tributaries of the Murray-Darling River system. NPM is located within four sub-catchments in the headwaters of the Bogan River. (WRM Water & Environment, 2006).

The existing NPM operations have significantly modified the drainage characteristics of these four sub-catchments. Open cut voids and overburden stockpiles have altered the topography of the catchments. Extensive drainage interception works have been constructed to ensure that all potentially 'dirty' and 'mine' surface water runoff from disturbed areas is collected and prevented from flowing to natural watercourses.

There are numerous water storages across the NPM site as shown on Figure 11. There are also a number of retention ponds, sediment ponds and stilling ponds that ensure the fullest separation of 'clean', 'dirty' and 'mine' water runoff (WRM Water & Environment, 2006).

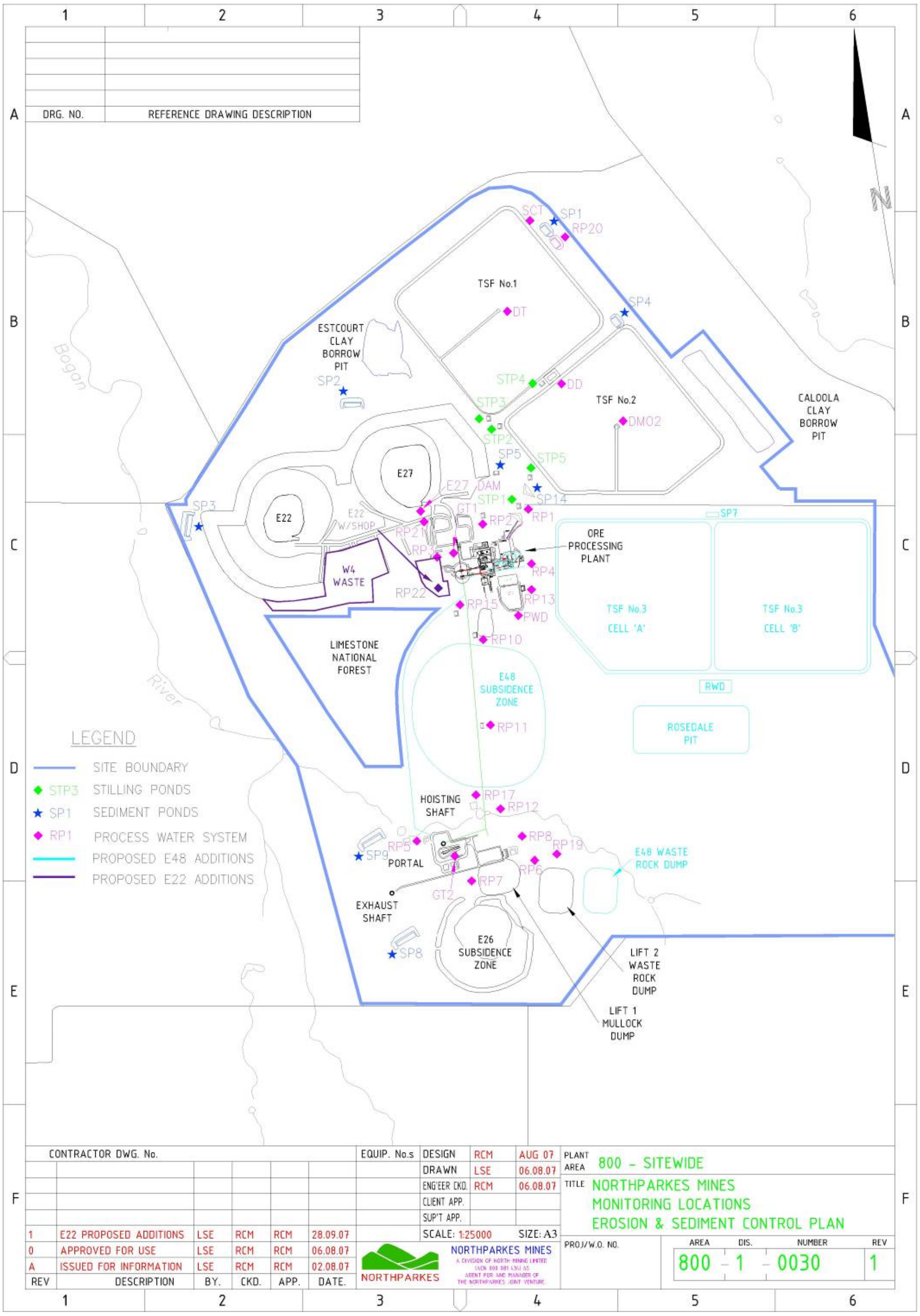


Figure 11 Surface water storage

5.5.2.E48 Impact Assessment Outcome

Water is required at the mine site for ore processing, underground and open cut mining activities, dust suppression, construction activities and domestic potable water requirements. Approximately 5,350 ML of water is used by the NPM operations each year, of which approximately 80% is used for ore processing. This is made up of fresh water supplied by PSC; water recovered from the TSFs and captured surface water runoff.

The E48 project involved a major upgrade to water management across the site. The findings of the E48 EA were that:

> *With the proposed management measures to be implemented for the E48 Project infrastructure, and given the existing 'no release' management strategy would be retained, there would be no additional impact on the surrounding watercourses as a result of the E48 Project. The self-imposed water quality criteria would ensure that in the rare event of a surface water release, the water quality would be such that the Water Quality Objectives for the surrounding watercourses and Macquarie-Bogan catchment would not be compromised. The E48 Project would have very little impact on the flow regimes of nearby creeks with a marginal reduction in the area (0.9 ha or 0.05% of the catchment area) draining directly into Goonumbla Creek. There would be no impact on the catchment area draining to Cookapie or Tenandra Creeks.*
>
> *The E48 Project would not involve the storage or harvesting of 'clean' water from the Project Site for mine site use above those storages that are already constructed, hence, the Project would have no impact on harvestable water rights in the catchments affected by mining operations.*
>
> *NPM operations would continue to use recycled and harvested water from the Project Site as much as possible to minimise the use of external water from the Lachlan Catchment and is not seeking additional water supplies from the Lachlan River for the E48 Project. Therefore, the E48 Project should not have any impact on the objectives and provisions of the Lachlan Catchment Blueprint and the Water Sharing Plan for the Lachlan Regulated River Water Sources.*[14]

5.5.3. Methodology for Modification Assessment

This surface water impact assessment closely follows the DGRs and requests received through consultation with DWE and DPI (MR).

Agency Comments

Comments from DPI (MR) and DWE were received requesting that the EA address surface and groundwater impacts and mitigation measures for the proposed modification. These comments, provided in Appendix A, have been considered in this assessment.

[14] Corkery and Associates (2006)

5.5.4. Modification Impact Assessment

General

The proposed modifications to the existing development consent considered in this EA will require additional water to be supplied from external sources. The addition of Estcourt TSF may have the potential to pollute surface waters.

Surface water quality

NPM site water management objectives include the protection of clean water systems. A critical commitment to this objective is to maintain zero discharge of process water into the surrounding environment (NPM 2007).

There are no off-site water transfers at NPM. The water management system is operated and managed to comply with s120 of the *Protection of the Environment Operations Act, 1997* as required under NPM's EPL 4784 Condition L1.

Surface water management at NPM involves:

- Classifying and segregating water streams;
- Minimising land disturbance (and opportunities for sedimentation);
- Maximising water efficiencies; and
- Preventing releases to the environment.

Subsequently, the only potential for offsite release is from sediment ponds situated on the mine lease. These sediment ponds are designed to allow suspended particulate matter to settle before the water is released. There are no other contaminants in sediment pond waters.

The release of waters from sediment ponds is expected to have no measurable impact upon the receiving aquatic environment as they discharge to the ground surface and are located a minimum 250 m from any watercourse.

The surface water monitoring program involves the monitoring of water quality of various surface water courses and water bodies onsite as well as upstream and downstream from the site.

An outline of the program to monitor the impacts of the operations on surface water quality is provided in Table 16.

All surface water monitoring and sample collection, storage and transportation is undertaken in accordance with the procedures outlined in AS/NZS 5667 – Water Quality - Sampling.

Table 16 Surface Water Monitoring Program

Monitoring Locations	Frequency	Analytical Suite
Watercourses	Annually or during rainfall events that result in flow	pH, EC, TSS, TDS, Cu, Na, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3

Monitoring Locations	Frequency	Analytical Suite
Farm Dams	Semi-annually	pH, EC, TSS, Cu
	Annually	pH, EC, TSS, TDS, Cu, Na, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3
Sediment Ponds	Quarterly or during rainfall events that result in flow	pH, EC, TSS, Cu
Process Water System	Quarterly	pH, EC, Cu
(including process water dams, TSFs, return water dams, E26 surge dams, retention ponds, grease traps, open cut sumps)[1]	Annually	pH, EC, TSS, TDS, Na, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3, Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Ni, Pb, Se, Th, U, Zn

Erosion and sediment control at NPM is designed to ensure effective management of surface water and sediment runoff. Erosion and sediment control measures will be consistent with the Managing Urban Stormwater: Soils and Construction Manual (DECC, 2008).

Historic, current and projected water usage figures

Total annual water usage (including source of supply) for the previous three years and estimated future requirements including the mine / mill expansion are provided in Table 17. Water usage consists of water sources from on-site recycling and harvesting and from external sources. In 2006, production was higher than 2005 and hence the total water requirement was correspondingly more in that year.

The projected total water requirement to accommodate the proposed mine / mill expansion to a production rate of up to 8.5 Mtpa is estimated at 6,970 ML. Of this, most of the water would be for ore processing operations.

Table 17 Annual Water Requirements at NPM (ML)

Water Source	2006	2007	2008	Mine / Mill Expansion[15]
External	3136	2562	2575	4416
Recycled	1424	1304	1290	2091
Harvested	123	418	372	400
Groundwater	63	63	63	63
Total Ore Processing Requirement	**4,747**	**4,347**	**4,300**	**6,970**

[15] Figures shown assume no further improvements in water use efficiency and median rainfall year.

Water Supply Sources

Potential sources of water supply at NPM include external (PSC), low and high security Lachlan River water, recycled water, harvested surface water and groundwater (refer to Table 15). The relative contributions from different sources would generally vary from year to year depending on rainfall, runoff inflows to various onsite storages and mine production rates.

Water is supplied to NPM from PSC through an in-principle agreement at the rate of approximately 85 – 130 L/s depending on the urban water demand. This water is sourced from the Lachlan Valley bore field at Forbes. The infrastructure supporting the supply of water (e.g. pipelines, pump stations) was jointly funded by PSC and NPM and services both the Parkes Shire and NPM.[16] The existing water supply system is operated and maintained by PSC. This infrastructure is not considered able to support the increased water supply required for the mine / mill expansion however with additional upgrade works this can be achieved.

NPM targets water storage on site of approximately 850 ML ensuring sufficient supply for four months operation to cover seasonal fluctuations in supply from PSC.

NPM is currently developing a formal water supply contract with PSC. The contract will supersede agreements currently in place and recognise NPM's requirements for surety of water supply.

NPM has strengthened its water supply security by purchasing bore licences sourced from the Lachlan aquifer. This allocation is pumped to NPM via the PSC supply line. Combined, these licences constitute approximately two-thirds of NPM's water requirements and represent an independent water supply for mining operations. NPM has also purchased temporary river water allocations on the open water market when water from other sources has been insufficient to meet site demand.

A summary of water licences held by NPM is provided in Table 18. NPM holds a Joint Water Supply Works licence in conjunction with PSC and PSC is the principal holder of the relevant Water Use Approval for this supply

Table 18 Water licence summary

Licence/Allocation	Type	Volume (ML)	Comment
70BL226550	Bore Licence	1000	Known as Bore 6. Actual allowance 1600 ML however total from this and 70BL228240 must be 1600 ML
70BL228240	Bore Licence	600	Known as Bore 7. Infrastructure DA lodged with Forbes Shire Council

[16] Northparkes Mines, 2008

Licence/Allocation	Type	Volume (ML)	Comment
70BL226584	Bore Licence	1050	Known as bore 8. Infrastructure DA lodged with Forbes Shire Council
Water Access Licence 8241	Regulated River (General Security)	2976	Allocation set annually
Water Access Licence 10082	Regulated River (General Security	1	Allocation set annually
Parkes Shire Council Agreement	Agreement / MOU	1900	
Total		**7527**	

Water recovered from the TSFs is returned to the processing plant for reuse. The amount of water recovered from the TSFs depends principally on evaporation losses and entrainment in tailings, and varies greatly between summer and winter months. On an annual basis, it is estimated that approximately 30% of the total water used is recoverable (and available for recycling) via returns to the processing plant.

The amount of water that can be harvested from the mine site depends on the amount of rainfall and runoff inflows into various storages. Based on an analysis of available rainfall records and anecdotal runoff data, it is estimated that about 400 ML of rainfall could be harvested from the mine site in a median rainfall year (506 mm)[17]. It is noted that the amount of water that can be harvested in any year is dependent on the distribution of rainfall (i.e. size of individual rainfall events) rather than the total annual rainfall.

Local groundwater supplies are generally poor in quality and quantity. The use of local groundwater at the mine site is insignificant. Small amounts of seepage collected in the open cut or underground mine is pumped into the process water system. The total available groundwater supply rate is estimated at approximately 2 l/s (63 ML/year). This rate is assumed to be relatively constant for all years for the water balance computations.

Water Management

The management of water at NPM is extensively scrutinised through a site water management team. Opportunities to increase efficiency and reduce consumption are explored and implemented where practical. External expertise including Rio Tinto Technology and Innovation has been employed to assist in this process.

Examples of water management strategies implemented at NPM include:

- Reducing evaporation:

[17] WRM Pty Ltd, 2006

- Floating modules – recently trialled innovation used to reduce evaporation on TSFs and other dams at NPM. NPM was awarded the NSW Minerals Council Environment Award in 2007 as a result of this initiative;
- Minimise decant pond on active TSF. NPM has reduced the number of storage dams used, hence reducing stored water surface area exposure to evaporation.

- Water reduction in tailings entrainments:
  - Increasing the density of tailings slurry pumped into the TSFs.

Water Balance

Table 17 shows the overall NPM water requirements for mine / mill expansion conditions, based on an ore production rate of 8.5 million tonnes per year. Overall water usage for years 2006 – 2008 are shown for comparative purposes. A water flow diagram is provided in Figure 12.

Water requirement values shown in Table 17 and water licences detailed in Table 18 indicate the following:

- The proposed mine / mill expansion would not change the existing overall balance for NPM operations as the proportion of water sourced externally would remain approximately the same;
- The annual volume of external water supply required would be ~4,500 ML to process 8.5 million tonnes per year; and
- NPM currently has sufficient water licences to accommodate the volume of external water supply required for the mine / mill expansion.

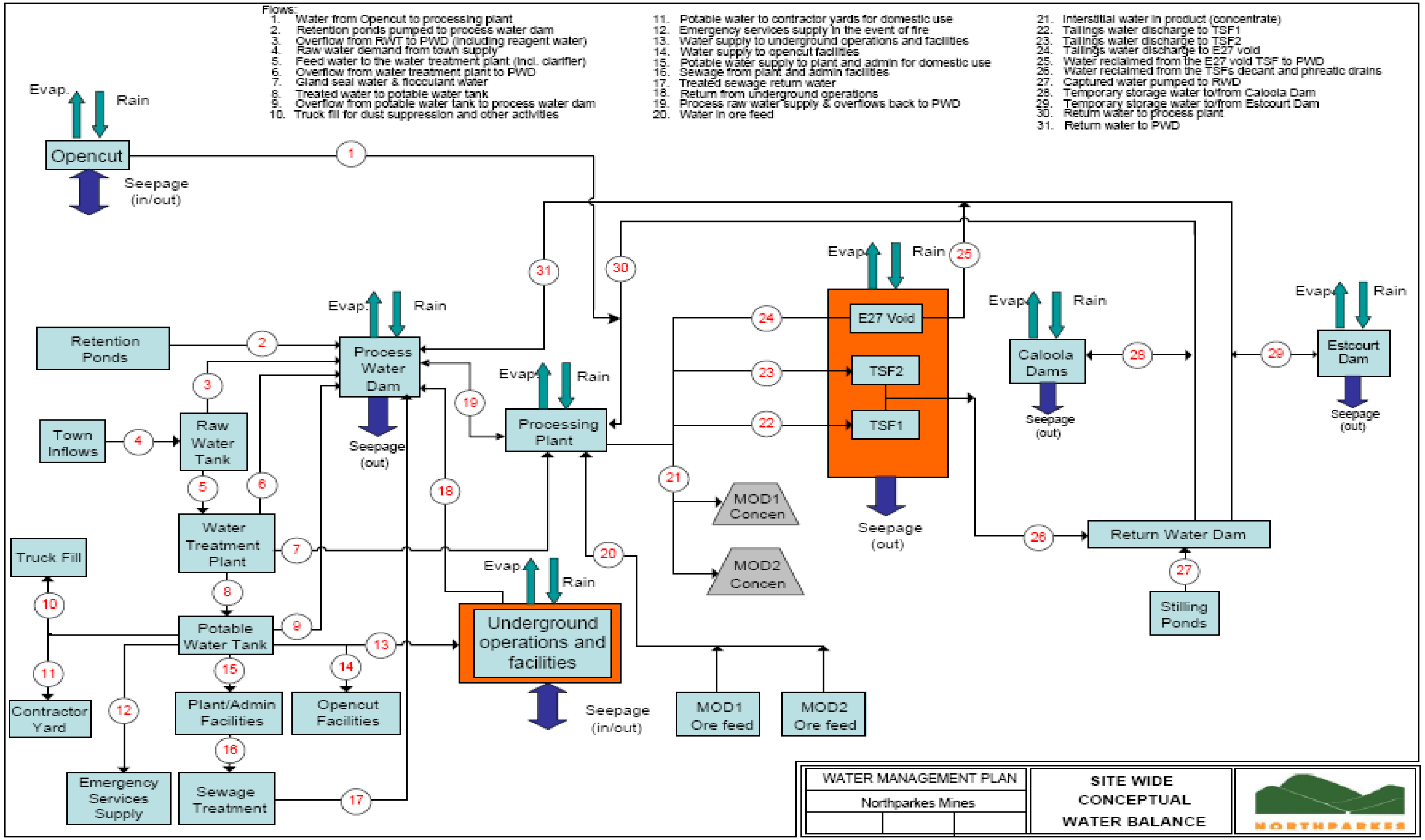


Figure 12 NPM site water balance

Conclusions

NPM operations would continue to maximize the use of recycled and harvested water from the site and continue to investigate and implement water saving measures to minimise the use of external water from the Lachlan Catchment.

NPM has existing rights to surface water resources through the arrangement with PSC and to licensed river and bore allocations owned by NPM. The mine achieves a recycle rate of ~30% throughout the operations. Combined, the existing licenses and allocations are considered adequate to meet total external water supply requirements for the additional production rate of up to 8.5 Mtpa. Therefore, the proposed modifications should not have any impact on the objectives and provisions of the Lachlan Catchment Blueprint and the Water Sharing Plan for the Lachlan Regulated River Water Sources.

5.5.5. Mitigation Measures and Safeguards

No additional mitigation measures are proposed for surface water management and use as a result of this modification. Existing surface water extraction entitlements, coupled with groundwater extraction, are considered sufficient and the surface water monitoring program will be reviewed to include the Estcourt TSF.

5.6. Groundwater Resources

This section summaries the results of hydrogeological and geotechnical investigations conducted in the Estcourt TSF and Rosedale TSF areas to characterise the hydrogeology and permeability of the strata which would form the base of these TSFs and underlies the site at depth. Further detail is presented in Appendix G.

5.6.1. Introduction

The geology of the mine area is characterised, as regolith-overlying bedrock comprised of volcanics and mafic intrusives, which forms the host rock to the mineralisation.

The regolith is described as consisting of several layers, with a thin surface layer of soil underlain by red-brown or grey to white clays. The red-brown clay is described as moderately plastic and a relatively homogenous clay unit. It ranges in thickness from 2 to 21 m across the larger E27 study area, which includes the Estcourt TSF site to the north of the E27 pit. The grey clay, described as platy in texture, may be gradational to the overlying red-brown clay. It is believed to be predominately kaolinite and can be mottled in appearance.

Parsons Brinckerhoff (PB) (2003) note the total thickness of the regolith ranges between 10 to 40 m and on a regional scale, the thickness of the regolith increases in a northwards direction obtaining a maximum thickness in the valley area of the Wombin State Forest to the north of the mine site.

The extremely weathered bedrock underlying the clays of the regolith is sometimes referred to as saprolite[18]. The base of the saprolite was inferred from the borehole data to be between depths of 21 to 48 m. The degree of weathering tends to decrease with depth, and the zone between the saprolite and fresh bedrock is described by PB (2003) as the oxidised zone. The oxidised zone is more permeable than the saprolite and ranges in thickness from 7 to 45 m and is the principle zone exploited for water supply in the area. Fresh host rock is found underlying the oxidised zone.

5.6.2.E48 Impact Assessment Outcome

Corkery and Associates (2006) summarised the principal means by which the E48 project would influence the groundwater would be through:

- the void or subsidence zone created by block caving within the E48 ore body; and
- the placement of tailings within TSF 3 (Cells A and B).

As is the case with potential seepage from TSF 1 and TSF 2, the long-term potential seepage from TSF 3 would be to the north with some leakage attracted to the E48 subsidence zone. Travel rates for any seepage would be exceptionally slow (e.g. 1 km per 1,000 years) and then it is likely that the clays present would adsorb or modify any mobile metals within the seepage. The impacts of such seepage would therefore be negligible.

5.6.3.Methodology for Modification Assessment

The PB (2003) report “In-Pit Tailings Disposal, Hydrogeology Investigation and Groundwater Impact Assessment” has been used to analyse the data relevant to the Estcourt and Rosedale TSF sites. The PB (2003) report was prepared to support the Statement of Environmental Effects submitted as part of the development application for in-pit tailings storage using open cut pit E27. The development was subsequently approved and has since been incorporated into the existing development consent.

5.6.4.Modification Impact Assessment

Permeability Testing

The results of permeability tests carried out on undisturbed samples of the regolith and saprolite recovered during construction of monitoring bores in the areas of interest are listed in Table 19. Two of the bores were located in the Estcourt TSF area: bore MB8 is located on the eastern side of the Estcourt TSF adjacent to TSF 1 and bore MB10 is located to the north. In the Rosedale TSF area, bore MB15 is located near the northwest corner and bore MB14 is located to the south and west.

Testing of the saturated regolith materials in these bores included laboratory permeability analysis of undisturbed samples and core. The undisturbed push tubes

[18] Thoroughly decomposed rock, a clay rich soil formed in place by chemical weathering of igneous or metamorphic rocks; features of original rock structure (e.g. phenocrysts) are often preserved by differences of colour or mineralogy in the clay.

and core samples were subjected to laboratory falling head and triaxial tests to determine the permeability.

The formation shown on the borehole logs are listed in Table 19 and the results indicate the clay and underlying saprolite in the Estcourt area to have a very low permeability in the order of 1 E-10 to 2 E-11 m/s. The results in the Rosedale TSF area are also very low at less than 2.5 E-11 m/s.

The results from the E27 pit investigations also shown in Table 19, indicate the very low permeability results for the clays and saprolite are consistent across the larger study area surrounding the E27 and E22 pits and TSF 1 and TSF 2.

Table 19 Results of Permeability Testing in the Regolith

Bore	Test Type	Depth tested	Formation	K (m/d)	K (m/s)
Estcourt Area					
MB08	Falling Head	4-4.4	Saprolite – grey silty clay	8.64 E-6	1.00 E-10
MB10	Falling Head	2.5-2.9	Clay – medium brown	1.73 E-6	2.00 E-11
MB10	Falling Head	7-7.3	Clay – grey in-situ weathered rock	3.2 E-6	3.7 E-11
Rosedale Area					
MB14	Triaxial	5.5-5.9	Saprolite - grey white clay	2.94 E-7	3.4 E-12
MB15	Triaxial	2-2.3	Red brown clay	2.16 E-6	2.5 E-11
MB15	Triaxial	7-7.4	Saprolite – grey clay	2.68 E-7	3.1 E-12
E27 Pit Area					
MB11	Falling Head	4-4.3	Grey – white clay	1.73 E-5	2.0 E-10
MB12	Falling Head	4.5-4.8	Medium brown clay	8.64 E-6	1.0 E-10
MB13	Triaxial	4.5-4.8	Red – brown clay	6.65 E-5	7.7 E-10

Knight Piésold conducted geotechnical investigations during 2008 in the Estcourt TSF and Rosedale TSF area. The bore hole logs in both areas confirm the lithology, as described by PB (2003) is consistent across the site and generally show between 2 to 10 m of stiff to very stiff clay overlying a silt which is described as silt clayey or a silt with clay and sometimes with sand and trace fine gravels.

Groundwater Modelling Results

PB (2003) constructed a 3 layer numerical model for the site and simulated flow paths assuming a E27 pit TSF with tailings to 26 m above the natural surface level. The pre-mining groundwater flow direction in the oxidised zone is shown as from south to north across the region with a hydraulic gradient of approximately 0.0035.

The PB (2003) groundwater modelling results show travel times of an inert solute in the oxidised zone of the host rock to be extremely slow at approximately 1,000 years per kilometre. They predicted it would take about 5,000 years to reach the nearest bore which is located about 4 km from E27 open cut pit. Results of the geochemical assessment indicate that the mobility of the potential metal contaminants from the tailings would be low due to the buffering capacity in the aquifer system. PB (2003) concluded that the very long travel times would allow ample time for attenuation processes to occur and predicted negligible impacts to the groundwater regime or to the nearest potential receptor (a licenced and unused groundwater bore) were likely to occur from the permanent use of E27 open cut pit as a TSF.

PB (2003) also concluded that movement of tailings water down to the top of the more permeable oxidised zone is expected to be negligible due to the much lower permeabilities in the regolith.

Tailings Characteristics

Australian Tailings Consultants (ATC (2000)) undertook a suite of laboratory tests to determine the characteristics of NPM tailings. This data confirmed earlier tests by Knight Piésold.

ATC (2000) derived a relationship between permeability and void ratio[19] as:

$$k = 1.15x10^{-7}\ e^{3.0745}$$

In addition, ATC (2000) derived a relationship between void ratio and effective overburden pressure as:

$$e = 2.35\ \sigma'^{-0.0986}$$

The average void ratio of the tailings in TSF 1 and TSF 2 is taken as 1.0 for design purposes. This implies an average permeability for the tailings deposit of $1x10^{-7}$ m/s. ATC (2000) estimated that the void ratio at the base of a 30 m deep tailings deposit would be about 0.7, from which a permeability of $4x10^{-8}$ m/s can be inferred.

Previous studies (EGI (1996) and CSIRO (1997a 1997b)) have shown that the NPM tailings have a high acid neutralising capacity, resulting in negative net acid producing potential (NAPP). Both studies concluded that acid leachate conditions were unlikely to develop.

Estcourt and Rosedale TSF Potential Impacts

Previous permeability testing in, and adjacent to, the Estcourt TSF indicates that the regolith comprised of clays and saprolite has a very low permeability equal to or below 1 E-10 m/s. These results are consistent with test results across the larger E27 open cut pit site. The bore logs for MB8 and MB10 show the regolith material to be 32 to 36 m thick respectively. The Knight Piésold bore hole logs also indicate the low

[19] Void ratio is defined as the ratio of the volume of pore voids to the volume of the solid particles in a unit volume of soil.

permeability clay layer and underlying silt/saprolite is predominately comprised of clay and are continuous across the Estcourt TSF site.

The site location plan (Figure 5 on page 35) shows an area to the north of the Estcourt TSF where the shallow material has been excavated for construction material at the mine. The depth of the Estcourt borrow pit is understood to be less than 10 m. Based on the bore logs for MB8 and MB10 which are located either side of the borrow pit, a further 20 m of low permeability clay and saprolite would be expected to underlie the base of the borrow pit and separate low permeability tailings in the proposed TSF from the relatively more permeable oxidised host rock.

The permeability testing adjacent to the approved Rosedale TSF site also indicated very low permeability in the upper clay and underlying saprolite at two locations to the northwest and west of the Rosedale TSF site. The Knight Piésold bore hole logs also indicate the low permeability clay layer appears to be continuous across the site overlying the silt/saprolite.

As the groundwater flow direction typically reflects the surface topography, the development of open pits, subsidence zones and TSFs would be expected to modify the northerly pre-mining groundwater flow direction. Localised sinks (areas of lower groundwater levels) would be expected around any remaining open pits and subsidence zone and mounds of higher groundwater levels would be expected to be associated with the elevated TSFs.

Monitoring of the bores surrounding TSF 1 and TSF 2 has not detected any adverse effects as a result of flow of water from these facilities.

Based on the PB (2003) testing and modelling results the potential impacts of infiltration from the Estcourt and Rosedale TSFs would be expected to be negligible due to:

- The presence of very low permeability clay and saprolite underlying the Estcourt and Rosedale TSFs separating the tailings from the underlying higher permeability aquifer associated with the oxidised zone;
- The lower permeability of the clay and saprolite would be likely to result in even slower travel times compared to the oxidised zone which were modelled by PB (2003) to be in the order of 1,000 years per kilometre;
- The negative NAPP values of NPM tailings; and
- The presence of the clay and very slow travel times has been predicted to result in the attenuation of potential metals contaminants during transport.

5.6.5. Mitigation Measures and Safeguards

Based on the results of the assessment, additional floor preparation works within the Estcourt and Rosedale TSF footprint would not be required to protect the groundwater resources from contamination.

No additional mitigation measures are proposed for groundwater management as a result of this modification. The existing groundwater monitoring program will be reviewed to include the Estcourt TSF.

5.7. Hydrology and Flooding

This hydrological study is an additional element that was not required in the E48 EA. The full report is provided in Appendix F.

5.7.1.Introduction

The location of the proposed secondary and tertiary crushers is approximately 2 km upstream of the confluence of Goonumbla Creek with the Bogan River. The catchment area of the creek upstream of the site extends upstream to Goonumbla Hill and Bogan Road and is approximately 17 km^2 in area. Two tributaries of Goonumbla Creek converge approximately 1 km upstream of the proposed location of the crushers.

The terrain is gently sloping with slopes ranging from 0.5% to 2% with the exception of Goonumbla Hill.

The following data was available for the study:

- Aerial imagery of the NPM Site;
- 1 m contours for the area in the vicinity of the site. The imagery and contours show the proposed location of the crushers but do not extend to the upper areas of the catchment. In this region a NSW topographic map was used to determine runoff and surface roughness;
- Location plans of the proposed layout of the crushers; and
- Secondary Crushing Plant drawings prepared by GW Engineers. These drawings were used to determine the location and elevation of the crushers. The elevation of the base of the crushers was estimated to be 280.6 m.

5.7.2.E48 Impact Assessment Outcome

The impact of the crusher installation on the hydrology of Goonumbla Creek was not considered in the original E48 EA because there were no modifications to the existing fill platform supporting the hoisting shaft.

5.7.3.Methodology for Modification Assessment

Hydrology

A RAFTS model was established for the catchments draining to the NPM site. The model was used to estimate peak flow for the Australian Rainfall and Runoff 100-year ARI design storm event.

Storm durations of 25 minutes to 9 hours were simulated using the RAFTS model. The 3 hour storm resulted in the largest flow at the proposed location of the crushers. The flow at this location was calculated as 50 m^3/s.

Hydraulics

A HEC-RAS one-dimensional model was established to:

- Simulate existing conditions at the site, without the proposed crushers; and
- Develop conditions, with the proposed crushers and associated fill platform protruding on the edge of the floodplain.

The proposed culverts (9 barrels of 3.3 w x 1.2 h) at the location of the crushers were modeled using details shown in drawings developed by GW Engineers.

5.7.4. Modification Impact Assessment

The results from the simulations showed that:

- The crushers would be located approximately 1.2 m above the 100-year ARI event flood levels;
- Under existing 100-year ARI event conditions flow depths would be approximately 350 mm corresponding to a flood level of 279.85 m RL, at the location of the crushers. Average flood velocity would be approximately 0.55 m/s;
- Under developed conditions the average flow velocity in the proposed culverts adjacent to the crushers would be approximately 2 m/s; and
- The construction of the crushers and the adjacent culvert and embankment structures results in an increase in the 100-year ARI event flood level of 450 mm at the location of the crushers.

5.7.5. Mitigation Measures and Safeguards

It is recommended that suitable armouring of the fill platform supporting the crushers and the creek at the culvert crossing be provided to prevent erosion during flood events. This armouring may comprise rock protection or other environmentally sympathetic measures.

5.8. Transportation

5.8.1. Introduction

This section contains a summary of the traffic assessment within the E48 EA and an assessment of impacts of the proposed modification.

5.8.2. E48 Impact Assessment Outcome

The E48 Traffic Assessment concluded that the main changes in existing traffic levels would be during the 32-month construction period of E48 would be as follows:

Bogan Road – between the Newell Highway and the mine access road

- Mine-related light vehicles would increase by approximately 40% to 454 per day from existing operations; and

- Mine-related heavy vehicles would increase by approximately 48% to 74 per day from existing operations.

Coradgery / Robertson / Taweni Roads

- Mine-related light vehicles would increase by approximately 58% to 54 per day.

Whilst the increase in traffic levels would be noticeable (as it was during the construction period for the E26 Lift 2 Project), the impacts of these changes in traffic levels would be minor as the total traffic levels are well within the capacities of the various local roads.[20]

5.8.3.Methodology for Modification Assessment

A desktop analysis was conducted as part of the modification since the E48 Transport Assessment covered the area in question for the modification.

The Northparkes Mines – E48 Project Traffic Assessment that was prepared by Transport and Urban Planning (2006) forms the basis of this assessment and is hereafter referred to as the 'Transport and Urban Planning report'.

In particular, the Transport and Urban Planning report:

- *Assessed existing traffic conditions, management and interim road improvements, with the existing site operations; and*
- *Identified likely constraints and nominated acceptable traffic and transport strategies commensurate with the future E48 proposal, including the 3 year construction phase.*

The following assessment relies upon the first point to gauge traffic impacts on site operations and second point gauges constraints on the construction phase.

Note that Transport and Urban Planning (2006) assumed an annual production throughput of 5.5 Mt.

5.8.4.Modification Impact Assessment

Following on from the E48 EA it is considered that similar conclusions can be drawn subject to the same rigour in management, as has been the case.

Access to Estcourt TSF, ore processing plant and the secondary and tertiary crushers will be via the existing mine access that has been designed for low traffic demands. This access has been designed for all types of vehicle that will be entering the site during construction and operational phases and is considered to have the capacity to accommodate the project.

Construction

During the construction period, traffic movements would predominantly be related to the arrival and departure of construction workers and delivery of material and

[20] Transport and Urban Planning – Traffic Assessment for E48 (August 2006)

equipment. The main potential traffic impact would be vehicles entering and exiting the site on Northparkes Lane.

Traffic generation information provided is based on the construction activities required for the construction of new plant and equipment and Estcourt TSF.

The number for vehicles required for the movement of material for the construction of the Estcourt TSF are 166,525 truck movements, these movements will be onsite moving material from existing stockpiles to the TSF site. Vehicles to be used during construction are likely to be existing on-site mining equipment.

During the construction of the plant and equipment, the traffic generated by the proposed construction activity would impact on the road network surrounding the site. The worst case scenario for the construction period would be that an additional 1 heavy vehicle per day, 10 light vehicles per day and approximately one (1) 20 persons bus per day over a 26 week period would be generated.

Operation

The traffic generated during operation of the proposed modification is principally comprised of the following:

- Inbound materials; and
- Outbound products.

The estimated daily vehicle movements during operation of the modification at full capacity (8.5 Mtpa) is as follows:

- Inbound materials - consumables (2 additional movements per week); and
- Outbound products - concentrate delivered to Goonumbla Rail Siding (8 additional movements per week).

Assessment of impacts

Construction vehicles would arrive via the Bogan Road and access the site from Northparkes Lane. Operational vehicles would predominantly remain the same as the E48 project with some minor on-site and delivery changes.

The majority of the traffic movement would occur outside of peak commuter periods and thus the impact on the access route for the regional network and the local road network would be minimal. The intersection of Bogan Road and Northparkes Lane (Austroad Type A standard) has been identified to have spare capacity sufficient to accommodate this traffic under the E48 Traffic Assessment.

The existing road formation and pavement condition for both internal and public roads are such that the proposed construction traffic can be safely accommodated.

5.8.5.Mitigation Measures and Safeguards

It is considered that the construction and operation of the project will not incur significant impacts in terms of traffic. The road systems involved are all of a capacity and design to accommodate the light and heavy vehicle movements required by the project.

5.9. Ecology

5.9.1. Introduction

Environmental Planning & Assessment Act 1979

The EP&A Act forms the legal and policy platform for development assessment and approval in NSW and aims to, *inter alia*, 'encourage the proper management, development and conservation of natural and artificial resources'. The proposal is a Major Project according to *State Environmental Planning Policy (Major Projects) 2005* and as such, is to be assessed under the provisions of Part 3A of the EP&A Act, with the Minister for Planning as the Consent Authority for the Project Application.

A Section 75W modification for the proposed modification at NPM is required to account for changes in the current approved project in accordance with the requirements of the EP&A Act.

Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides legal status for biota of conservation significance in NSW. The TSC Act aims to, *inter alia,* 'conserve biological diversity and promote ecologically sustainable development'. It provides for:

- the listing of 'threatened species, populations and ecological communities', with endangered species, populations and communities listed under Schedule 1, 'critically endangered' species and communities listed under Schedule 1A, vulnerable species and communities listed under Schedule 2;
- the listing of 'Key Threatening Processes' (under Schedule 3);
- the preparation and implementation of Recovery Plans and Threat Abatement Plans; and
- requirements or otherwise for the preparation of Species Impact Statement (SIS).

The TSC Act has been addressed in the current assessment through:

- desktop review to determine the threatened species, populations or ecological communities that have been previously recorded within the locality of the site and hence could occur subject to the habitats present;
- targeted field surveys for threatened species listed under the Act;
- development of suitable impact mitigation and environmental management measures for threatened species, where required; and
- assessment of potential impacts on threatened species.

Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) regulates the clearing of native vegetation on all land in NSW except for land listed in Schedule 1 of the Act. Excluded land under

Schedule 1 of the Act includes National Parks and other conservation areas, State forests and reserves, and urban areas. Specifically, urban areas, which are excluded, include areas zoned residential (but not rural residential), village, township, industrial or business.

According to s.75U(e) of the EP&A Act, an authorisation under Section 12 of the NV Act to clear native vegetation is not required for a project approved under Part 3A. Hence, the NV Act does not apply to the current proposal.

Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act), provides for the declaration of noxious weeds by the Minister of Agriculture. Noxious weeds may be considered noxious on a National, State, Regional or Local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the NW Act. As such, if present, noxious weeds on the site should be controlled in accordance with the control category specifications.

State Environmental Planning Policy 44 – Koala Habitat Protection

State Environmental Planning Policy 44 (SEPP 44) aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline'.

Schedule 1 of SEPP 44 lists the local government areas to which SEPP 44 applies. The site is within Parkes LGA. Parkes LGA is listed under Schedule 1.

SEPP 44 requires that before granting consent for development on land over 1 hectare in area, a consent authority must be satisfied as to whether or not the land is 'potential' and 'core' koala habitat. Potential koala habitat is defined as 'an area of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component'.

Core koala habitat, is defined as 'an area of land with a resident breeding population of koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population'. Where core koala habitat is found to occur, SEPP 44 requires that a site-specific Koala Plan of Management be prepared.

SEPP 44 was addressed by targeted surveys for Koalas and Koala feed trees and searches for signs of recent Koala activity.

Environment Protection and Biodiversity Conservation Act

The purpose of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a project, undertaking, development or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance (NES)' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Commonwealth Minister for the Environment and Water Resources.

In January 2007 the Commonwealth and NSW governments signed a Bilateral Agreement which accredits the assessment regimes under Part 3A, Part 4 and Part 5 of the EP&A Act for assessment purposes under the EPBC Act. The Bilateral Agreement applies only to proposals that the Commonwealth Environment Minister has determined are controlled actions under the EPBC Act, with the exception of nuclear actions (DoP 2007).

The EPBC Act identifies matters of national environmental significance as:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

The Administrative Guidelines for the EPBC Act (Department of the Environment & Heritage 2006) set out criteria intended to assist in determining whether an action is controlled and hence requires approval. In particular, the Guidelines contain criteria for determining whether a proposed action is likely to have a 'significant impact' on a matter of NES. Should the proponent deem the proposal likely to have a significant impact on a matter of NES, a referral to the Commonwealth Minister for the Environment would be undertaken to obtain a determination as to whether the proposal is a 'controlled action' requiring Commonwealth approval.

The EPBC Act has been addressed in the current assessment through:

- Desktop review to determine the threatened species or ecological communities that have been previously recorded within the locality of the site and hence could occur, subject to the habitats present;
- Targeted field surveys for species and ecological communities listed under the Act;
- Development of suitable impact mitigation and environmental management measures for threatened species, where required; and
- Assessment of potential impacts on threatened species.

5.9.2.E48 Impact Assessment Outcome

A Flora and Fauna Assessment was prepared as a specialist study to accompany the E48 EA (RW Corkery, 2006). The above mentioned assessment addressed potential impacts on native flora and fauna arising from the E48 Project. This included survey effort within the footprint for the proposed modification, however not all areas within the study area were surveyed in sufficient detail to assess potential impacts on native flora and fauna arising from the proposed modification.

This supplementary flora and fauna survey has been undertaken to obtain an up to date assessment of conservation significance and assess any likely impacts on flora and fauna associated with the proposed modification.

Previous assessment findings

The general assessment findings of the E48 EA were as follows (Corkery 2006) and are provided as context:

The E48 Project would involve a total of approximately 368 ha of surface disturbance, including the removal of approximately 108 ha of highly disturbed or re-growth vegetation, encompassing areas where the native vegetation is comprised of only scattered trees or a canopy of eucalypts with the understorey dominated by introduced species such as grasses. As such the area of native vegetation to be removed is overestimated. This conservative area of vegetation clearing represents less than 40% of the vegetation on the Project Site.

Although the proposed clearing would reduce the area of foraging habitat and mature hollow-bearing trees that provide potential roosting and refuge sites for common species using the Project Site and Threatened species known or potentially occurring within the Project Site, the existing revegetation program would be expanded into existing cleared areas outside the proposed disturbance areas to provide offsets for any native vegetation proposed for removal or disturbance. In addition, conservation farm management techniques and the reduction of grazing stock on the Proponent's agricultural areas would continue to enhance the vegetation and habitat resources of a once degraded agricultural landscape.

The current edge effects associated with existing woodland remnant and corridors are considered to be significant, allowing feral predators and introduced flora species to intrude into the habitats, hence the E48 Project is considered unlikely to result in any changes to existing edge effects. Any long-term potential impacts of edge effects resulting from the E48 Project would be minimised by the proposed mitigation measures.

The vegetation communities on the Project Site are already fragmented and isolated, hence the proposed clearing would not increase the barrier to fauna movement in the area. The ongoing and proposed revegetation programs would result in an increase in the connectivity of habitats in the area.

In order to compensate for the loss of native vegetation, areas would be revegetated in adjoining areas of native vegetation within and adjoining the Project Site. This program would concentrate on areas adjoining intact remnants to increase their size and viability over time and areas where increased connectivity between remnants can be achieved. The areas planned for revegetation and enhancement include large expanses of land adjoining remnants in other properties owned by the Proponent and the land swap area adjoining the Limestone National Forest.

5.9.3.Methodology for Modification Assessment

Scope of Report & Director General's Requirements

GHD undertook a survey program to support the EA, and to address the DGRs, which state that the biodiversity assessment must follow the NSW DECC *Guidelines for Threatened Species Assessment (DEC, 2005)*' under Part 3A of the EP&A Act 1979 and the NSW Groundwater Dependant Ecosystem Policy (DLWC).

The DEC (2005) guidelines identify important factors and/or heads of consideration that must be considered by proponents and consultants when assessing potential impacts on threatened species, populations, or ecological communities, or their habitats for development applications assessed under Part 3A. The guiding principles outlined in the guidelines and addressed in the current assessment are as follows:

- 'Maintain or improve' biodiversity values (i.e. there is no net impact on threatened species or native vegetation).
- Conserve biological diversity and promote ecologically sustainable development.
- Protect areas of high conservation value (including areas of critical habitat).
- Prevent the extinction of threatened species.
- Protect the long-term viability of local populations of a species, population or ecological community.
- Protect aspects of the environment that are matters of national environmental significance.

The assessment is designed to provide information and analysis to demonstrate that feasible alternatives have been considered, that the project has been designed to be consistent with the principles outlined above, and where there are impacts, that adequate mitigation measures and biodiversity offsets are implemented.

Consideration was also given to the *DEC Draft Threatened Biodiversity Survey and Assessment Guidelines* (2004) with regards to the scope and timing of flora and fauna surveys.

Literature Review

A desktop literature review was undertaken by GHD to identify the representative spectrum of flora and fauna, threatened species, populations and ecological communities listed under the NSW TSC Act and the Commonwealth EPBC Act that could be expected to occur within the study area, based on habitats present. To this end, the following documentation was reviewed prior to the field investigations:

- *Northparkes Mines - E48 Project Flora and Fauna Assessment* (Geolyse, 2006), incorporating the BTEQ (2006) *Flora Assessment*;
- *Anna's Island Pre-clearing Survey* (September 2008), Unpublished report by GHD for Northparkes Mines (GHD reference: 12857/72487).
- *Northparkes Mines Pre-clearance Survey* (December 2007), Unpublished report by GHD for Northparkes Mines (GHD reference: 2312359/71015)

- The NSW NPWS Wildlife Atlas database (October 2008– Data for the Forbes 1:100,000 Map Sheet. Additional Parkes LGA search for TSC Act listed flora and fauna. The Lower Slopes CMA Sub region was searched for EECs); and
- EPBC online Protected Matters Database (October 2008 – within the Parkes LGA).

Field Surveys

A targeted flora and fauna survey was performed by GHD ecologists from 13 to 15 October 2008. Survey effort is presented on Figure 13.

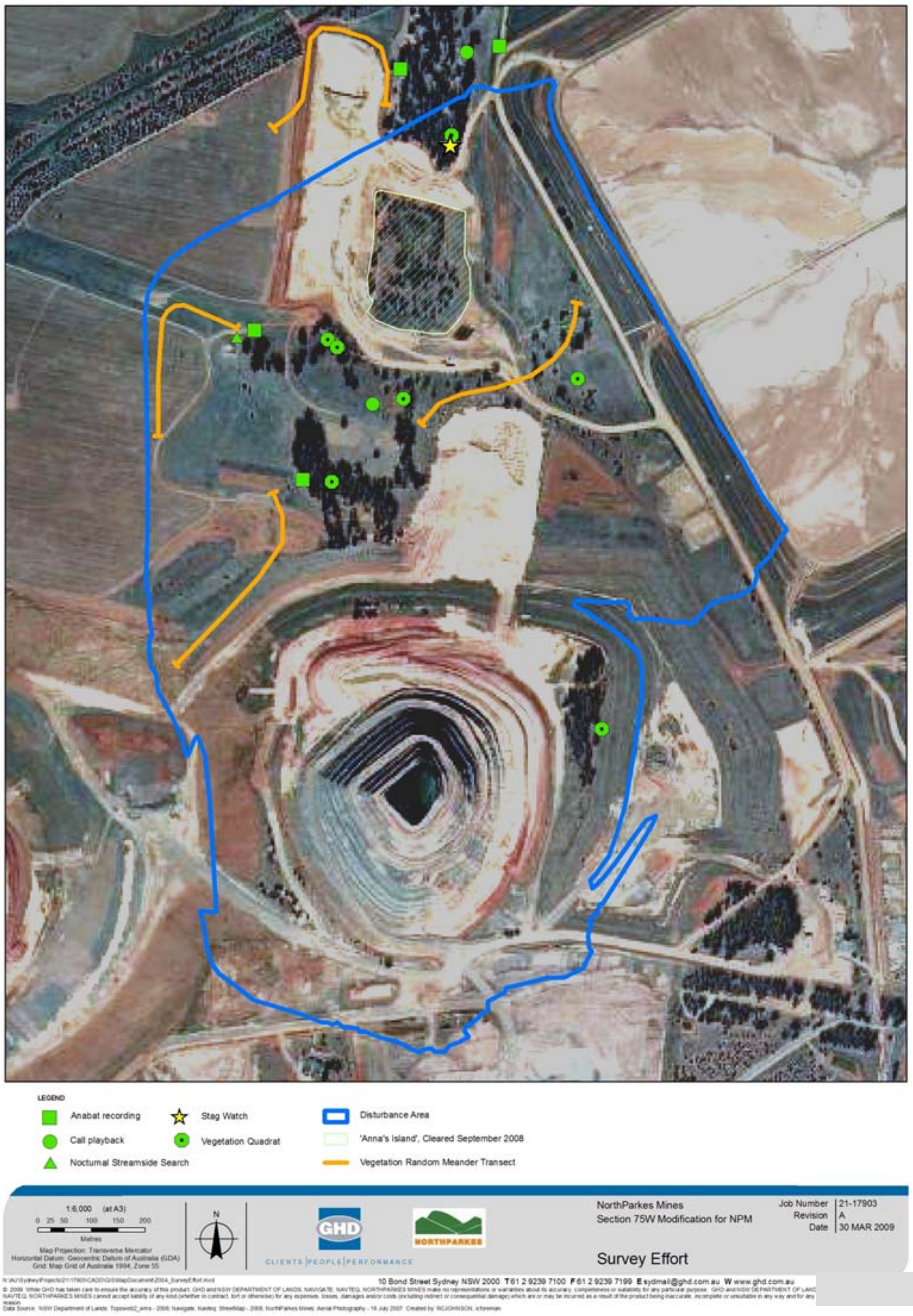


Figure 13 Survey Effort

5.9.4. Modification Impact Assessment

The findings of the GHD assessment are presented as follows.

The proposed modification would result in impacts on native flora and fauna, including:

- Clearing of approximately 14.3 ha of native vegetation including threatened fauna habitat;
- Clearing of TSC Act listed Endangered Ecological Communities (EECs);
- Removal of habitat resources including remnant native vegetation, and hollow bearing trees; and
- 'Likely' significant negative effects on local populations of the TSC Act listed Grey-crowned Babbler.

Key Thresholds

Pursuant to DEC/DPI (2005) assessment guidelines development applications under Part 3A must contain a justification of the preferred option based on the following key thresholds.

Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.

Specific impact mitigation and environmental management measures have been recommended for implementation to increase the certainty of the long term maintenance of the biodiversity values of the site during construction and operation of the proposed modification. This would substantially avert offsite impacts on surface waters, native vegetation and fauna habitats. The proposed activity will not mitigate all impacts on native flora and fauna within the proposed surface disturbance area. There are residual impacts on native biota, including threatened species and EECs. These impacts will require commensurate biodiversity offsets to ensure the proposed activity would "improve or maintain biodiversity values".

The comparison of ecological impacts, mitigation and offsets associated with the application of the "maintain or improve" test to the proposed activity are summarised in Table 20 below.

Table 20 Comparison of ecological impacts, mitigation and offsets

Impact	Mitigation	Offset
Removal of approximately 14.3 ha of native vegetation, comprising EECs including: Yellow Box Woodland (Box-gum Woodland EEC) 1.13 ha Grey Box Woodland and Native Grassland (Inland	Remediation and revegetation of the NPM area following mine closure Habitat enhancement in remediated areas through placement of hollow trees and improvements in habitat connectivity	Develop an offsets strategy in consultation with DECC that would: ◗ Identify 65 ha of land(s) containing appropriate 'like for like' vegetation communities listed in Table 21 and ensure

Grey Box Woodland EEC) 8.5 ha Bimble Box Woodland (Inland Grey Box Woodland EEC) 4.71 ha Impacts within 139 ha of low grade habitat in disturbed / cleared land Significant negative impacts on local populations of the Grey-crowned Babbler Removal of 45 hollow-bearing habitat trees Permanent loss of fauna habitat features (mature hollow-bearing trees, logs, leaf litter, ground debris, and other resources) that cannot be remediated	Retention of fallen timber (salvage of felled trees in development footprint) Retention of woodland in other parts of the study area Presence of similar woodland in the locality Pre-clearing surveys for (and salvage of) resident native fauna Surface water management, and avoidance of off site impacts Soil management and avoidance of erosion and sedimentation impacts	Table 21 and ensure they are managed for conservation under secure tenure, in perpetuity, either in the NPWS Estate or under a VCA, or equivalent; ◗ Or, an alternative arrangement with DECC that would ensure an equivalent, or better, biodiversity conservation outcome.

Whether or not the proposal is likely to reduce the long-term viability of a local population of any threatened species, population or ecological community.

The proposed modification will remove 14.3 ha of potential habitat for the Grey-crowned Babbler. Given the extensive disturbance in the local area, including the NPM site and surrounding agricultural lands, this habitat may have considerable value for local populations. There is insufficient evidence available to conclude that there is sufficient alternative habitat remaining in the locality to support a displaced local population. Therefore the proposed modification is likely to reduce the long-term viability of local populations of the Grey-crowned Babbler.

Whether or not the proposal is likely to accelerate the extinction of any species, population or ecological community or place it at risk of extinction.

The proposed modification is likely to have significant negative effect on the Grey-crowned Babbler and would likely reduce the viability of local populations, as described above. The proposed modification is however, considered unlikely to accelerate the extinction of this, or any other threatened species given the following considerations:

- Local populations of the Grey-crowned Babbler are likely to comprise a very small proportion of the total population of these species;
- Local populations of the Grey-crowned Babbler are more likely to be displaced by the proposed modification than killed;
- The relatively limited extent of clearing in terms of the overall distribution of the species;
- The limited value of habitat within the site, in terms of the overall distribution of the species, given its isolation, patchiness and ongoing disturbing activities from existing NPM operations;

- The maintenance of connectivity between areas of similar and suitable habitat in surrounding areas; and
- That the proposed modification is unlikely to inhibit the movement of migratory or nomadic fauna along recognised corridors or linkages in the locality or region.

Whether or not the proposal will adversely affect critical habitat.

No listed critical habitat will be removed or adversely affected as a result of this proposal.

Federal EPBC Act Assessment

On the basis of the assessments undertaken, it is concluded that the proposed modification is unlikely to impose "a significant effect" on any Matters of National Environmental Significance and hence would not constitute a controlled action as defined under the EPBC Act.

5.9.5. Mitigation Measures and Safeguards

General

The mitigation of adverse effects arising from the proposed modification has been presented according to the hierarchy of avoidance, mitigation and offsetting of impacts, consistent with the approach outlined in the DEC/DPI (2005) guidelines.

Potential impacts on native biota and their habitats will be greatest in surface disturbance area for the proposed modification. These impacts would be greatest during the construction phase due to direct habitat loss and modification. There is also potential for impacts on habitat outside the disturbance area during the longer-term operational phase of the proposed modification (eg lights and noise). Specific mitigation and environmental management measures have been incorporated into the proposal design to minimise such impacts on the natural environment surrounding the proposed modification, and in particular to reduce potential impacts on threatened species and their habitats. The potential adverse impacts of the proposed modification on flora and fauna and their habitats on site and on surrounding lands will be further reduced through the extension of existing Environmental Management Plans (EMPs) as required under DC 06-0026.

Whilst there will still be some unavoidable residual adverse impacts imposed upon some elements of the natural environment as a result of the proposed modification, these impacts are not expected to impose a significant impact on the native biota, including threatened species, EECs and their habitats, which occur on the study site or in adjoining habitats.

An offset package will be required to address these residual adverse impacts to achieve an overall 'maintain or improve' outcome for biodiversity conservation. This offsets package would be developed in consultation with DECC and the Department of Lands. The following sections detail the proposed mitigation measures and offset strategy.

Avoidance of Impacts

The location of the proposed modifications is constrained by the location of the operating mine and associated ore bodies. Therefore there is no scope for locating the proposed activities away from the sensitive environmental receptors identified in this assessment. The design and layout of the proposed modifications are constrained by engineering parameters.

The majority of the proposed modification works falls within land which is extensively modified by existing, approved NPM activities and agricultural land. Impacts on native flora and fauna are substantially less than would be associated with an undisturbed 'green field' site.

Mitigation of Impacts

It is recommended that a CEMP be developed for the site and include the mitigation measures outlined below.

Surface water management

The CEMP should include surface water management measures, including as a minimum the following principles currently used at NPM operations to manage surface water:

- Ensure the fullest separation possible of 'clean', 'dirty' and 'mine' water runoff;
- Minimise the area of disturbance, thus minimising the volume of 'dirty' or 'mine' water runoff;
- Runoff from disturbed and rehabilitated areas will be diverted into sediment ponds and allowed to settle prior to discharge in to the natural system;
- 'Mine' water will be collected, stored, recycled and handled in a separate water management system to protect the quality of 'clean' and 'dirty' water systems; and
- Ensure water management systems adopted at NPM operations do not adversely affect water quantity or quality in downstream water courses (NPM, 2007).

Soil management

Soil management should aim to ensure that topsoils are maintained in a form that will maintain their viability for regeneration of the site, minimise risks of erosion, sedimentation and the spread of environmental weeds. This would include measures such as:

- Minimise handling of soils through direct replacement onto progressive rehabilitation areas and careful selection of soil stockpile locations, where possible;
- Original topsoil should be retained and stockpiled to assist in future remediation of the NPM site;
- Minimise handling of soils during periods of high soil moisture (i.e. during or immediately following wet climatic conditions);
- Restrict vehicle access on topsoil stockpiles once created, to minimise compaction, erosion and transfer of weeds;

- Topsoil stockpiles would be positioned away from direct surface water runoff; and
- Topsoil stockpiles should be sown with indigenous native grasses of local provenance as soon as is practicable to minimise the amount of bare earth available for the recruitment of weeds.

Dust

Appropriate construction measures must be incorporated to minimise the generation of dust and associated impacts on adjacent natural environments. These should include:

- Setting appropriate speed limits for construction traffic to limit dust generation; and
- Applying water to internal haul roads during construction, where required.

Pre-clearance Survey

A detailed pre-clearance survey by a qualified ecologist will be required prior to construction. This should involve:

- diurnal searches for birds, nests and roosts;
- targeted searches for Grey-crowned Babbler nests;
- active searches for reptiles, including checking of woody debris within the construction footprint,
- active searches for frogs, focussing on aquatic and wetland habitats;
- active searches for micro bats, including checking under exfoliating bark; and
- nocturnal surveys, including stag-watching of identified habitat trees, specifically focusing on observing use of hollows by micro bats.

This survey would focus on locating individuals, and especially roosts of threatened species.If nests or nestlings of threatened species are observed within, or close to, the surface disturbance footprint then construction should be postponed until the nestlings have hatched and fully-fledged. If construction constraints mean that this delay is not practicable then DECC should be consulted to determine the most appropriate relocation method.

Construction should commence in the south of the proposed surface disturbance area and proceed northwards. This approach would maintain vegetated corridors as long as possible, maximising opportunities for fauna to escape northwards into remnant vegetation to the north of the site.

Tree Fauna Management

Mitigation measures for tree dwelling fauna are required as the proposed works involves the removal of mature trees including hollow-bearing habitat trees. Further, nesting birds were observed in the Estcourt TSF surface disturbance footprint during field surveys and would potentially occupy the site during construction. Due care during clearing is recommended to reduce direct impacts to any tree dwelling fauna species which may be utilising the area.

The CEMP should detail procedures for fauna management including the following:

- habitat trees should be monitored for fauna during clearing operations;
- habitat trees with resident fauna should be avoided as far as is practicable by postponing clearing through these areas. Where it is not practical to clear during these times, the pre-clearance survey should minimise the potential impact on these species; and
- hollow-bearing habitat trees should be placed nearby revegetation areas.

Groundcover Clearance Protocol

Groundcover substrate, especially large woody debris, provides important habitat for native fauna, including threatened species. It is recommended that the following protocol be incorporated into the CEMP:

- As part of the preclearing survey a qualified ecologist will identify large woody debris or rock fragments that warrants relocation;
- During construction, remove identified large woody debris and rock fragments using excavator grabs, where possible; and
- Place intact large woody debris and rock fragments within nearby revegetation areas.

Site Management

The following mitigation measures are recommended in order to minimise construction impacts:

- Setting appropriate speed limits for construction traffic to reduce the risk of fauna road fatalities; and
- Restrict access into adjacent remnant vegetation during construction by appropriate marking / fencing of the Estcourt TSF surface disturbance footprint.

Weed and Pest Management

It is recommended that the following measures be adopted to manage environmental weeds during construction:

- Stockpiles of fill or vegetation should not be placed in areas of adjoining remnant vegetation but instead within existing cleared areas;
- To limit the spread of weeds into adjoining remnant vegetation the surface disturbance footprint should be temporarily fenced;
- Incorporate control measures in the design of the proposed works to limit the spread of weed propagules downstream of Estcourt TSF;
- Progressive rehabilitation of disturbed vegetation to limit the potential for colonisation by weeds;
- Monitor and control noxious weed species in line with legislative obligations; and
- Perform ongoing monitoring of weed infestation on and adjoining the site.

Revegetation and Habitat Enhancement

NPM has, wherever possible, been able to maintain sections of remnant vegetation within its landholding. The vegetation communities identified across the site consist of small remnants and linear corridors, such as along roadsides. Ongoing revegetation plans aim to provide appropriate linkages between these areas of adjoining vegetation.

Linking of existing remnant vegetation with wildlife corridors provides feeding and movement routes for local fauna. Wildlife corridors are established or improved along fence lines, road verges, creeks and drainage lines through an annual revegetation program. This program involves the planting of approximately 10,000 trees per annum, if conditions are suitable, as part of the continuing rehabilitation strategy. In excess of 150,000 trees have been planted to date within the landholding.

The areas planned for revegetation and enhancement expand into the existing cleared areas outside the mine lease to provide offsets for any native vegetation proposed for removal or disturbance. This annual program concentrates on areas adjoining intact remnants to increase their size and viability over time and areas where increased connectivity between remnants can be achieved.

Rehabilitation of the surface disturbance occurring at the Estcourt TSF site would be undertaken in accordance with the existing rehabilitation strategy already implemented at NPM. Since this rehabilitation strategy would be applied to areas of the NPM site which had previously been cleared it would eventually result in an increase in native vegetation cover at the NPM site and an improvement in the extent and connectivity of habitat in the locality.

Offsetting of Impacts

The proposed modification would result in impacts on native flora and fauna, including:

- Clearing of approximately 14.3 ha of native vegetation including threatened fauna habitat;
- Clearing of TSC Act listed Endangered Ecological Communities (EECs);
- Removal of habitat resources including remnant native vegetation, and hollow bearing trees; and
- ‘Likely’ significant negative effects on local populations of the TSC Act listed Grey-crowned Babbler.

Therefore biodiversity offsets will be required in order to satisfy the requirements of the DEC/DPI (2005) guidelines and Part 3A of the EP & A Act. The final details of this offsets strategy would be negotiated between NPM and DECC and would ensure that the proposed modification ‘improves or maintains’ biodiversity values.

GHD compared a range of comparable offset strategies applicable to the proposed development (i.e. mining projects) and developed an offsets strategy in accordance with relevant guidelines and previous planning decisions for mining projects.

From the research undertaken for projects associated with mining, the proposed attributes of a conservation offset site should include:

- A minimum of 65 hectares of native woodland (an offset ratio of approximately 4.5:1);
- Recipient site(s) as identified within an adopted rehabilitation management plan;
- 'Like for like' ecological communities, consistent with the vegetation types summarised in Table 19;
- A minimum 5-year establishment and maintenance period; and
- Insurance against catastrophic loss (e.g. fire).

Note: These parameters may change depending on the 'mix' of offset actions proposed. NPM may seek conservation outcomes on land, containing remnant vegetation, that is either private land(s) or NPM owned land(s) or a combination of the two.

Conclusions

The outcome of this assessment is that the proposed modification would require an offsets strategy to be developed in consultation with DECC that would:

- Identify 65 ha of land(s) containing appropriate 'like for like' vegetation communities listed in **Table 21** and ensure they are managed for conservation under secure tenure, in perpetuity, either in the NPWS Estate or under a VCA, or equivalent; or
- Agree to an alternative arrangement with DECC that would ensure an equivalent, or better, biodiversity conservation outcome.

Table 21 Indicative vegetation types to be conserved in offset site

Vegetation community in s.75 modification area	Area to be cleared (ha)	'Like for like' Vegetation Type(s) for inclusion in offset site
Yellow Box Woodland (Yellow Box tall grassy woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276))	1.1	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201) (LA145) White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267) (LA218) White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion (Benson 266) (LA219) Yellow Box tall grassy

Vegetation community in s.75 modification area	Area to be cleared (ha)	'Like for like' Vegetation Type(s) for inclusion in offset site
		woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276) (LA226)
Grey Box Woodland and Native Grassland (Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76))	8.5	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76) (LA154)
Bimble Box Woodland (Mixed box woodland on low sandy-loam rises on alluvial plains in central western NSW (Benson 248))	4.7	Inland Grey Box - White Cypress Pine tall woodland on sandy loam soil on alluvial plains of NSW South-western Slopes and Riverina Bioregions (Benson 80) (LA153) Mixed box woodland on low sandy-loam rises on alluvial plains in central western NSW (Benson 248) (LA162)
Total	**14.3**	

5.10. Visibility

5.10.1. Introduction

Historic and current mining activities have significantly altered the visual landscape. The proposed modification sites and existing operations are visible from most of the surrounding non-associated mine dwellings.

The infrastructure associated with the modification is within the current disturbance footprint of the mine. The Estcourt TSF will be constructed over both existing mine related disturbance and agricultural disturbance requiring some vegetation clearing.

The site landform undulates gently to the north. Other landscape features include:

- A natural buffer zone consisting of vegetation of between 2 and 5 m in height surrounding much of the site; and

- Existing mining operations including TSFs, waste rock dumps, underground hoisting shaft and processing infrastructure.

The design for the proposed modification has also attempted to maximise the use of existing cleared areas on the site to reduce the potential impacts associated with clearing.

5.10.2. E48 Impact Assessment Outcome

The E48 EA visibility impact assessment concluded "The main visual impact attributable to the E48 Project would be the construction of the TSF3. This structure would create a topographic high on land that is currently relatively flat. Due to the long-term presence of TSF1 and TSF2 in the vicinity, however, this impact was not considered significant".

5.10.3. Methodology for Modification Assessment

A desktop analysis and photographic survey has been conducted as part of the modification. This assessment is based on the location of the proposed modifications relative to the surrounding residences. The E48 visibility assessment paralleled the area in question for the modification.

5.10.4. Modification Impact Assessment

The principle components of the modification that could be seen from outside the mine boundaries include:

- The Estcourt TSF, consisting of an earth wall from the north western corner of TSF 1 along the northern boundary of the mine site to the E27 pit; and
- Some parts of the proposed modifications to the existing processing infrastructure including the secondary and tertiary crusher at the base of the underground hoisting shaft.

Impacts of the Estcourt TSF

The visible components of the Estcourt TSF will consist of an earth wall from the northwestern corner of TSF 1 along the northern boundary of the mine site to the E27 pit. The Estcourt TSF will appear as a continuation of the existing TSF 1 wall linking to the E27 waste rock dumps.

Table 21 outlines the potential visual issues regarding the view of Estcourt TSF from surrounding areas. Figure 14 shows the residences surrounding the mine. The north-western properties of 'Lone Pine' and 'Adavale' are of particular interest due to their proximity to the proposed Estcourt TSF.

Table 21 Potential visual issues – Estcourt TSF

Potential visual receiver	Number of viewers	Comment
Private land to the north	Low	Figure 14 and Figure 15 indicate that privately owned residences on land to the north would not be able to view the proposed development due to the existing tree plantings. Plate 6 shows the view of the mine from the entrance to 'Lone Pine' property. Just visible above the tree line is the E22 open cut western waste rock dump.
Adavale Lane	Moderate	Both east and westbound traffic will likely view filtered views of the earth wall while looking south from any gaps in the tree plantings (planted in 2000) such as farm access gates. The view from these points would be for a short distance, and while vehicles are travelling at considerable speeds. The Estcourt TSF will appear as a continuation of the existing TSF 1 wall. The impacts are therefore considered minimal and will further reduce as the tree plantings mature.

Figure 14 Land ownership and residences

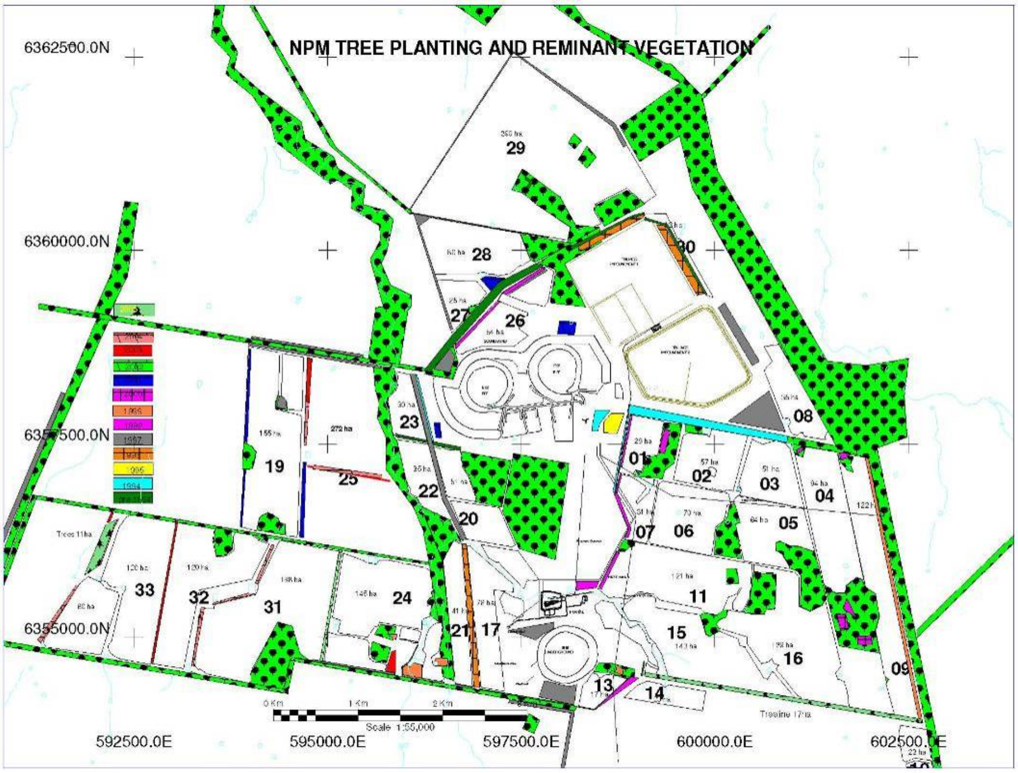


Figure 15 NPM tree planting and remnant vegetation

Plate 1 View of the Estcourt TSF site from the northeast from Adavale lane[21]

[21] TSF wall will be constructed on the opposite side of the tree planting

Plate 2 View of the Estcourt TSF site from the north from Adavale lane

Plate 3 View of the Estcourt TSF site from the northwest on Adavale Lane

Plate 4 View of the Estcourt TSF site from the northwest

Plate 5 View of existing TSF 1 wall from Adavale Lane

Plate 6 View from entrance to 'Lone Pine' looking southwest towards NPM

Impacts of proposed upgrades and modifications to the existing processing infrastructure.

The visible components of the proposed infrastructure at the existing processing site will consist of:

- An upgrade of Module 1 and Module 2 grinding and flotation circuits;
- Construction of Module 3 flotation circuit;
- An upgrade of the concentrate handling facilities;
- An upgrade of the tailings handling facilities; and
- Installation of secondary and tertiary crusher adjacent to the underground hoisting shaft.

Table 22 outlines the potential visual issues from surrounding areas.

Table 22 Potential visual issues – modification infrastructure

Potential visual receiver	Number of viewers	Comment
Bogan Road	Low	The proposed additional infrastructure is within the same footprint as existing equipment. At present the bulk of the infrastructure on site is screened by existing vegetation and equipment. The existing rill towers and hoisting shaft are visible and will remain the primary visual aspects of the mine infrastructure.
Adavale Lane	Low	Filtered views of the proposed development would be possible from Adavale Lane for passing traffic. This will mostly be of the existing TSFs, waste rock dumps and the proposed Estcourt TSF as discussed above.
Adavale Residence	Low	The proposed additional infrastructure is within the same footprint as existing equipment, at present the bulk of the infrastructure on site is screened by existing vegetation and equipment. There would only be limited opportunity to view the proposed development from this rural area.
Fernleigh Residence	Low	Filtered views of the proposed development would be possible from Fernleigh residence for passing traffic. However, this would generally occur only at on the western end of the property. This impact is considered minimal due to the site already being highly disturbed by the existing mine infrastructure.
Coradgery Residence	Low	Filtered views of the proposed development are possible through existing vegetation from the Coradgery dwelling. Tree plantings as shown in Figure 15 minimise these visual impacts.
M^{c}Clintocks Lane	Low	The rural area along the Lane generally has views across to the site. The existing rill towers and hoisting shaft are visible and will remain the primary visual aspects of the mine infrastructure. These views would be filtered by existing vegetation in the rural area, as well as the vegetation buffer planted between the site and McClintocks Lane.

5.10.5. Mitigation Measures and Safeguards

There are no additional mitigation measures proposed over those detailed in the E48 EA. NPM will continue to maintain a buffer zone and progressively rehabilitate over the life of the mine.

5.11. Aboriginal Heritage

5.11.1. Introduction

An Aboriginal Heritage Assessment was prepared as a specialist study to accompany the Environmental Assessment – Northparkes Mines E48 Project (Corkery and Associates, 2006). The assessment addressed potential impacts on Aboriginal heritage arising from the E48 project. The study area for the abovementioned assessment included survey effort within the footprint for the Project.

A supplementary Aboriginal heritage survey was undertaken to obtain an up to date assessment of significance and assess impacts on Aboriginal heritage associated with the Project. OzArk was commissioned by GHD to undertake the Aboriginal cultural heritage assessment component of the (EA) for the proposed modification sites.

The full Aboriginal Cultural Heritage Assessment is presented as Appendix E.

5.11.2. E48 Impact Assessment Outcome

The E48 Aboriginal Heritage Assessment identified several sites of archaeological significance and recommended protection or salvage of those sites/artefacts depending on the potential for the E48 Project to impact on them.

5.11.3. Methodology for Modification Assessment

The Aboriginal cultural heritage survey investigated the area of land to be impacted by the Estcourt TSF and the surface crusher operations. These impacts include the construction of the Estcourt TSF, associated pipelines, drainage lines and roads. An additional area for the surface secondary and tertiary crusher units near Goonumbla Creek was included within the study. The secondary and tertiary crusher units are to be located within Zone 1, a designated area of moderate archaeological sensitivity (Figure 16).

The survey of the Estcourt TSF study area took place between Tuesday 25 and Wednesday 26 November 2008. Information and maps supplied by NPM were used to delineate the boundaries of the study area and provide information regarding the nature of the proposed impacts. There was no hindrance to accessing the entire study area.

5.11.4. Modification Impact Assessment

The entire study area has suffered various levels of disturbance to any archaeological deposits had they once existed.

One Aboriginal site, a culturally modified (scarred) tree (NPM-ST1) was recorded. The scar is contained within a dying Grey Box (*Eucalyptus microcarpa*), which has a height of approximately 20 m and a trunk diameter of 2.22 m. The scarred trunk is long dead. The scar measures 960 x 350 mm and is located 1130 mm from the ground. The scar has a depth of 120 mm. The scar is a symmetrical, ovoid shape orientated to the south-west. There were axe marks present.

Conversations regarding the significance of the culturally modified tree were held with local Wiradjuri community representatives on site and at a meeting of the Aboriginal Heritage Working Group (AHWG) on Friday 12 December 2008. The significance of the site was assessed as being of high cultural significance and of value to the local Wiradjuri community. No other sites or culturally significant material were recorded as a result of this survey.

It is considered appropriate that the Aboriginal Heritage Management Plan (AHMP) is revised to include the management of NPM-ST1 in relation to the project impacts. This revision will be required to be ratified by the AHWG.

While construction of the secondary and tertiary crusher units will impact on subsurface soils, it was assessed that this work will have minimal impact on potential archaeological deposits as these are very unlikely to exist in a scientifically meaningful form. Aboriginal cultural heritage impacts in Zone 1 are covered by management measures within the AHMP. Specific management of the surface crusher operations would involve local Wiradjuri representation to monitor removal of topsoil material.

The landforms of the study area were assessed as having overall low potential for the existence of undetected sub-surface archaeological deposits.

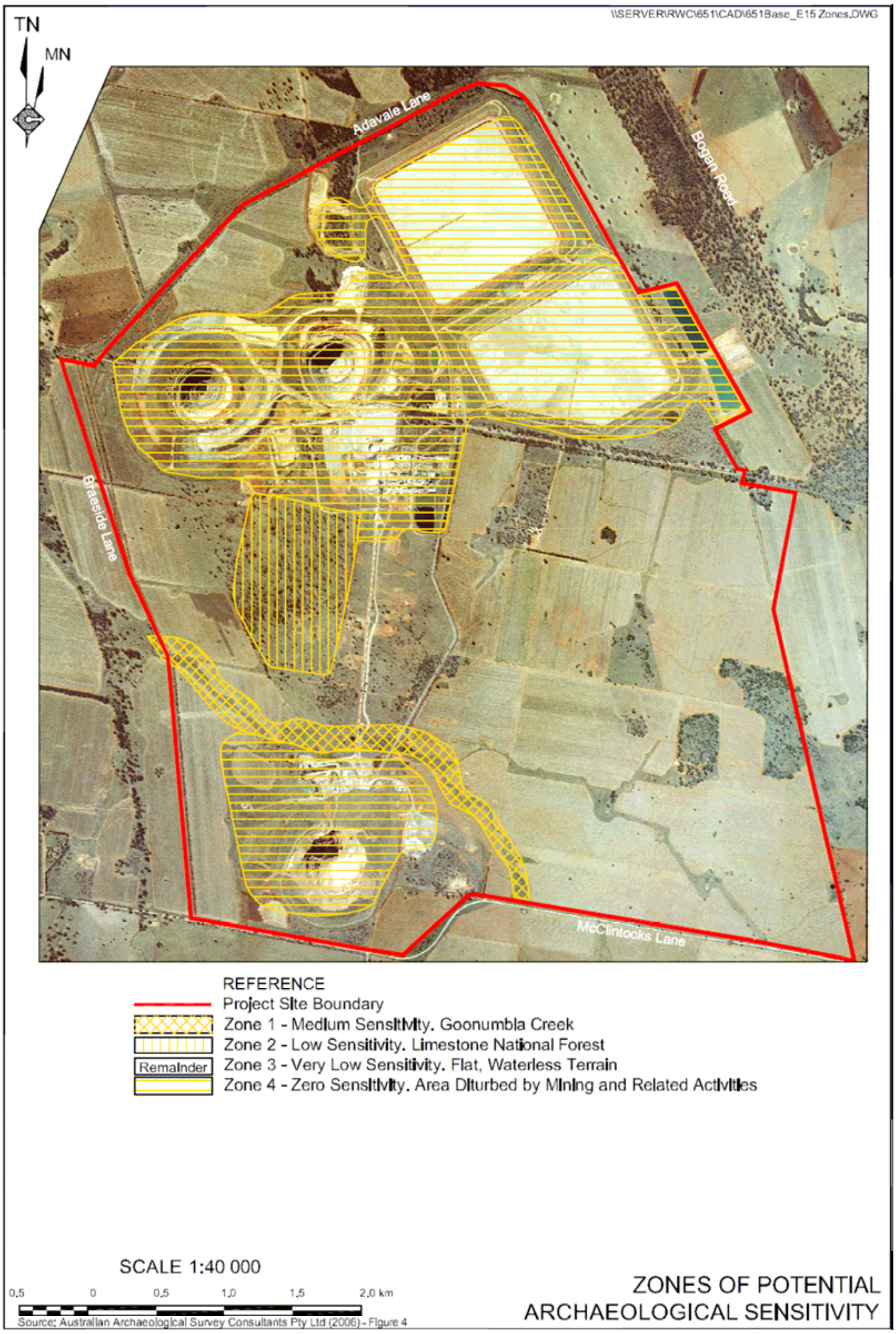


Figure 16 Zones of potential archaeological sensitivity

5.11.5. Mitigation Measures and Safeguards

As the proposed works are likely to damage or destroy NPM-ST1 and moving the tree to a secure location will likely result in its disintegration it is recommended that:

- NPM-ST1 is to be recorded to archival standards. This recording should include a full photographic record (on film in both black/white and colour), accurate measurements and descriptions, and a cast of the scar; and
- The AHMP is revised to include reference to the identified Aboriginal site NPM-ST1 and the implementation of management measures as identified in the above recommendation;

Regarding the secondary and tertiary crusher site, it is recommended that:

- Specific management of surface crusher operations within Zone 1 will involve local Wiradjuri representation to monitor removal of topsoil material; and

Should any 'relics' or other Aboriginal materials / sites be identified anywhere in the study area during the course of construction, work in that area should cease and the AHWG and the DECC Northwest Office be contacted to discuss how best to proceed.

Should the above recommendations be adhered to, there is no further impediment to the proposed works on the grounds of Aboriginal cultural heritage.

5.12. European Heritage

5.12.1. Introduction

A European heritage assessment was undertaken by Australian Archaeological Survey Consultants to accompany the Environmental Assessment – Northparkes Mines E48 Project (R.W. Corkery 2006).

5.12.2. E48 Impact Assessment Outcome

The E48 European heritage assessment concluded that:

- Three (3) items of interest were located in the E48 project footprint; and
- No items were identified for local and state significance.

5.12.3. Methodology for Modification Assessment

Given the previous work undertaken on the E48 project, a desktop study has been considered appropriate for this EA.

5.12.4. Modification Impact Assessment

A desktop assessment of *Parkes Local Environmental Plan 1990*, the NSW State Heritage Inventory, NSW State Heritage Register and Register of National Estate was carried out to crosscheck the E48 project work for more recent information.

Fourteen listed items of heritage significance within the Parkes LGA were identified; two (2) are listed on the State Heritage Register, being the Parkes Post Office and the

Parkes Railway Station Group. The remainder are individual or group items listed on the Parkes LEP and State Heritage Inventory. No items in the local area are listed on the Register of National Estate.

None of the identified heritage items are located within or within close proximity to the proposed modification sites.

5.12.5. Mitigation Measures and Safeguards

No mitigation measures are proposed.

5.13. Socio-Economic Environment

5.13.1. Introduction

The socio-economic impact of the proposed modification can be assessed by consideration of:

- The employment implications for the proposed increase in production and construction of associated infrastructure and TSF; and
- The impacts that the increase in production and construction of associated infrastructure will have on public amenities.

The use of groundwater for agricultural or other purposes is not considered in this socio-economic assessment because, as discussed in section 5.5, the additional water required for the processing increase is addressed in existing water allocations, as assessed and approved by DWE.

The Northparkes Mines – E48 project prepared by R. W. Corkery & Co. Pty Limited (2006) forms the basis of this assessment and is hereafter referred to as the 'Corkery report'.

In particular, the Corkery report assessed:

- Social infrastructure services; and
- NPM financial contributions.

The following assessment identifies the expected number of additional personnel required for the increase in production from 6.5 Mtpa to 8.5 Mtpa and associated additional infrastructure.

5.13.2. E48 Impact Assessment Outcome

Corkery and Associates (2006) refers to the construction of the E48 project and predicted approximately 300 additional contractors being employed for various lengths of time over an approximate 32-month period. It was further estimated that an average of 150 persons would need accommodation over the 32-month period. This represented a potential temporary increase in the population of Parkes of approximately 2%.

The influx of approximately 300 contractors during the 32-month construction period, 95% of whom would be Parkes based, would provide a boost to the local economy as these contractors use local services.

Additionally, the construction period would see the expenditure of approximately $180 million in capital costs, good and services throughout Parkes Shire, NSW, other states and overseas. None of the specialist environmental assessments identified any significant, long term impacts on the surrounding landowners or the Parkes community in general during the construction period.

During the operation of the E48 project, the employment level would reduce to approximate current employment levels and as such, any pressure on PSC infrastructure and services that arose during the construction period would be removed. The current annual salary payments of approximately $10 million would be maintained, as would the good and services payments and those to all levels of government. Additionally, the life of the overall operation would be extended by approximately 7 years, hence prolonging the economic benefits of the operation to the local region and NSW in general.

The extension of the mining operation and the continued contributions to the local, State and Federal economies would be a beneficial impact of the E48 project. None of the specialist environmental assessments identified any significant long-term impacts on the surrounding landowners or the Parkes community in general during the operation of the E48 project.

5.13.3. Modification Impact Assessment

The modification continues the impacts and influences identified in the E48 EA.

Construction and operation of the proposed scheme could be expected to have negligible to minimal impacts on the local socio-economic environment.

Construction

During the modification construction period, approximately 40 additional contractors would be employed out of the 150 identified in the E48 EA for various lengths of time over an approximate 48-week construction period. This will not significantly increase the population of Parkes during this period nor impact on services required other than the positive impacts expected from the injection of wages into the town’s businesses.

Operational

During the operation of the modification, the employment level would reduce from construction levels as indicated in the E48 EA to current employment levels. At which point PSC infrastructure and services will not be further impacted upon.

5.13.4. Mitigation Measures and Safeguards

The overall socio-economic impact of the construction and operation of the project is not anticipated to create any increase in public infrastructure services nor will it generate any additional long-term employment. The extension of the mining operation and the continued contributions to the local, State and Federal economies would be a beneficial impact of the modification. No specific mitigation measures are proposed.

6. Draft statement of commitments

6.1. Preamble

Section 75F(6) of the EP&A Act states that the 'Director-General may require the proponent to include in an environmental assessment a statement of the commitments the proponent is prepared to make for environmental management and mitigation measures on the site'. In accordance with this requirement, this section provides NPM commitments for environmental mitigation, management and monitoring for the project.

This part of the EA has been compiled to reflect the requirements of Part 3A of the EP&A Act, and presents a compilation of the actions and initiatives the Proponent commits to implement if the proposed modification receives planning approval. These commitments are designed to effectively manage, mitigate, guide and monitor the project through its construction and operation.

The EA of the proposed modification has identified a range of environmental and social management outcomes and measures, all required to avoid or reduce the environmental and social impacts of the project.

All parties involved in the design, establishment and operational phases of the project will be required to undertake their work in accordance with the relevant nominated commitments and conditions included in the planning approval for the project.

For each draft commitment, the desired outcomes are provided together with the intended actions and timing for the implementation of the nominated actions.

6.2. Statement of Commitments

Table 23 presents the original Development Consent (DC 06-0026) SOCs and any additions or alterations proposed by the Proponent.

Table 23 Draft Statement of Commitments

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
1. PROJECT COMPONENTS AND ENVIRONMENTAL MANAGEMENT				
Continue operation of existing activities	1.1	Undertake all activities as described in Part B (and summarised on **Figure F1**) of E48 EA.	Ongoing for life of mine	Undertake all activities as described in Part B (and summarised on Figure F1) of E48 EA and Section 2 of Section 75W EA.
Construct and operate the E48 mine and related components	1.2	Undertake all activities as described in Part C (and summarised on **Figure F1**) of E48 EA.	Ongoing for life of mine	Undertake all activities as described in Part C (and summarised on Figure F1) of E48 EA and Section 3 of Section 75W EA.
Comply with all conditional requirements in all approvals, licences and leases.	1.3	Comply with all commitments recorded in **Table F1** of E48 EA.	Continuous and as required.	Comply with all commitments recorded in this table.
	1.4	Comply with all conditional requirements included in the: ◗ Planning Approval; ◗ Environment Protection Licence; ◗ Mining Leases; and ◗ Any other approvals.	Continuous and as required.	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
Conduct all operations in accordance with all relevant documentation.	1.5	Undertake all activities in accordance with any current Mining Operations Plan, environmental procedures, safety management plan or site-specific documentation.	Continuous and as required.	No amendment proposed.
2. OPERATING HOURS				
Construction and operating hours are managed in accordance with the approved planning approval conditions.	2.1	Blasting (underground): 24 hours per day, 7 days per week.	Continuous during project construction and operations	No amendment proposed.
	2.2	Blasting (open cut): 9.00 am to 5.00 pm, Monday to Saturday		No amendment proposed.
	2.3	Underground Mine Development: 24 hours per day, 7 days per week.		No amendment proposed.
	2.4	Underground Mining: 24 hours per day, 7 days per week		No amendment proposed.
	2.5	Tailings Storage Facility Construction: 24 hours per day, 7 days per week		No amendment proposed.
	2.6	Maintenance: 24 hours per day, 7 days per week		No amendment proposed.

Desired Outcome	Action		Timing	Additions or alterations arising from the Section 75W Modification
	2.7	Processing: 24 hours per day, 7 days per week		No amendment proposed.
	2.8	Product Transport ◗ Trucks: 24 hours per day, 7 days per week (but timed to avoid school buses) ◗ Trains: 24 hours per day, 7 days per week		 No amendment proposed. No amendment proposed.
3. NOISE AND VIBRATION				
Noise impacts attributable to the Project are minimised at all surrounding residences and comply with DEC criteria.	3.1	Regularly service major earthmoving equipment to ensure equipment sound power levels are within nominated range.	Standard servicing schedules	No amendment proposed
	3.2	Avoid unnecessary clustering of earthmoving equipment.	During all above ground construction activities.	No amendment proposed
	3.3	Minimise TSF 3 construction at night during gentle winds towards "Avondale" and temperature inversions.	During adverse weather conditions when "Avondale" residence is occupied.	

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	3.3A	Additional Action	During adverse weather conditions at 'Lone Pine'.	Minimise Estcourt TSF construction at nighttime during noise enhancing conditions such as gentle wind towards 'Lone Pine' and temperature inversions
All open cut blasts meet DEC airblast overpressure and ground vibration criteria at all surrounding residences.	3.4	Ensure all blasting contractors adopt appropriate blasting controls to minimise air blast overpressure and vibration.	All open cut blasts	No amendment proposed
	3.5	Monitor open cut blasts at 'Hubberstone'.	All open cut blasts	No amendment proposed
4. SOILS AND LAND CAPABILITY				
Maintain soil value for rehabilitation and minimise soil loss through erosion.	4.1	Minimise handling of soils.	During soil stripping operations	No amendment proposed.
	4.2	Select soil stockpile locations to minimise subsequent movement.	During soil stripping operations	No amendment proposed.
	4.3	Minimise handling of soils during periods of high soil moisture.	During soil stripping operations	No amendment proposed.
	4.4	Topsoil stockpiles will be created between 1m and 2m in height while subsoil stockpiles will not normally exceed 3m in height.	Continuous	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	4.5	Prevent mobile equipment, including light vehicles, from accessing soil stockpiles once created.	Continuous	No amendment proposed.
	4.6	Install well maintained upslope water diversion banks or swales where overland surface water flow has the potential to impact on the soil stockpiles.	Continuous	No amendment proposed.
	4.7	Implement downslope sedimentation controls as required.	Until the surface of the soil stockpile is stabilised	No amendment proposed.
	4.8	Sow surfaces of soil stockpiles with appropriate groundcover.	As soon as practicable following construction	No amendment proposed.
	4.9	Take reasonable measures to protect natural or stockpiled soils from any spills or contaminating activities.	Continuous	No amendment proposed.
	4.10	Ensure Soil Mapping Unit SMU2 subsoils >70cm in depth are mixed with overburden before being stockpiled.	During soil stripping campaigns.	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
5. AIR QUALITY				
Undertake site activities without exceeding DEC air quality criteria or goals.	5.1	Avoid disturbing areas outside approved footprints of disturbance (including tracks).	During construction periods	No amendment proposed.
	5.2	Keep unsealed roads damp when in use by off-road trucks.	As required	No amendment proposed.
	5.3	Tailings storage facilities operated to minimise dust and capped as early as practicable.	Continuous	No amendment proposed.
	5.4	Erect and maintain partial cover on above ground conveyors.	Continuous during operations	No amendment proposed.
	5.5	Progressively rehabilitate areas no longer required for operational purposes.	As required	No amendment proposed.
	5.6	Prepare and implement a dust control strategy.	As required	No amendment proposed.

Desired Outcome	Action		Timing	Additions or alterations arising from the Section 75W Modification
6. SURFACE WATER AND WATER SUPPLIES				
Ensure the surface infrastructure related to the E48 project and modification works is incorporated into a comprehensive surface water management system compatible with the existing surface water management system.	6.1	Construct appropriate catch drains and diversion banks around the margins of TSF3 (Cell A).	Prior to construction of TSF 3 (Cell A)	No amendment proposed.
	6.2	Construct necessary sediment ponds to contain sediment-laden water on site.	Prior to construction of TSF 3 (Cell A)	No amendment proposed.
	6.3	Maintain the existing drainage systems for Farm Dams south of the mine access road.	Until TSF 3 (Cell B) works commence	No amendment proposed.
	6.4	Construct catch drains and diversion banks around the margins of TSF 3 (Cell B).	Prior to construction of TSF 3 (Cell B)	No amendment proposed.
	6.4A	Additional Action	Prior to construction of Estcourt TSF	Construct catch drains and diversion banks around the margins of Estcourt TSF.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	6.4B	Additional Action	Prior to construction of Estcourt TSF.	Incorporate Estcourt TSF in to existing surface water management system
	6.4C	Additional Action	Prior to commissioning of secondary and tertiary crushers.	Ensure suitable armouring of the fill platform supporting the secondary and tertiary crushers is provided to prevent erosion during flood events.
Ensure that there is a secure water supply to the E48 Project	6.5	To work with the Parkes Shire Council and other relevant authorities to put in place a formal agreement relating to various matters associated with the volumes and quality of water required to support the NPM operations, the future infrastructure requirements and the use of water entitlements post mine.	Commencing immediately with a view to completion by 2006 year end.	No amendment proposed.
Ensure no 'dirty' or 'contaminated' water leaves the Project Site as a result of the E48 Project surface disturbance.	6.6	Vegetate the embankments of TSF 3 to provide erosion protection, with consideration to be given to subsequent afforestation of these areas or rock armour the embankments to minimise erosion.	On completion of each TSF 3 embankment construction	Stabilise the embankments of TSF 3 and Estcourt TSF to provide protection using vegetation or rock armour to minimise erosion.
	6.7	Contain tailings supernatant and accumulated rainfall within the processing plant water circuit for extreme rainfall events up to 1 in 100 year 72 hour storm or sustained wet periods.	Continuous	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	6.8	Continue to negotiate and reach agreement with Parkes Shire Council regarding the supply of water during the operational phase of the NPM operations.	As required	No amendment proposed.
	6.9	Undertake activities at the premises in a manner that does not cause or permit water pollution as defined in the *Protection of the Environment Operations Act 1997*.	Continuous	No amendment proposed.
Ensure the NPM operations water usage from off-site sources do not cause unacceptable short falls for other users,	6.10	Continue to negotiate and reach agreement with Parkes Shire Council regarding the supply of water during the operational phase of the NPM operations	As required	No amendment proposed.
7. TRAFFIC				
All motorists travel safely to and from the NPM operations.	7.1	Ensure all employees and contractors are regularly informed about the safe driving requirements to and from the NPM operations.	Continuous	No amendment proposed.
	7.2	Transport all oversize loads with all necessary permits.	As required	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
Interaction between the road train and school bus is avoided.	7.3	Avoid despatch of road train (with concentrate) between 7:30 am/9:30 am and 3:00 pm/5:00 pm.	School days	No amendment proposed.
The standard of road pavement is maintained at an appropriate level for the type and volume of traffic.	7.4	Continue to work collaboratively with the Parkes Shire Council on road pavement and traffic issues. An ex gracia annual road maintenance contribution of $50,000, index linked will be made in order to help maintain Bogan Road in good repair.	Annually or as agreed	No amendment proposed.
8. GROUNDWATER				
Protect the groundwater resources from contamination.	8.1	Ensure the floor and walls of TSF 3 have a permeability satisfying the standard required by the DEC (i.e. <1 x 10^{-9} m/s).	During construction program	Ensure the floor and walls of TSF 3 and Estcourt TSF have a permeability sufficient to protect the groundwater resource.
	8.2	Conduct testing to ensure required permeability levels are achieved.	During construction program	Carry out permeability testing to document and ensure the adequacy of as built conditions.
	8.3	Ensure all programs for managing hydrocarbons and chemicals are fully implemented.	Ongoing	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	8.4	Prepare a Groundwater Management Plan for the entire project site in consultation with and to the satisfaction of the Department of Water and Energy.	Within 6 months of the grant of planning approval.	No amendment proposed.
	8.5	Additional Action	Prior to commissioning of Estcourt TSF.	Review groundwater monitoring bores around Estcourt TSF and install additional bores as required.
9. ECOLOGY MANAGEMENT AND BIODIVERSITY OFFSET STRATEGY				
Minimise long term impact on flora and fauna on and around the Project Site.	9.1	Clearly identify the boundaries of all construction areas. No clearing will occur outside these boundaries.	Prior to clearing	No amendment proposed.
	9.2	Where practicable, clearing of mature trees within woodland communities will be timed to avoid fauna breeding seasons. In any event, a pre-clearing survey will be undertaken prior to all operations involving the clearing of mature trees. If necessary, individual fauna species will be relocated.	During clearing	Where practicable, clearing within woodland communities will be timed to avoid more sensitive breeding, torpor and dispersal periods of the year. Where it is not practicable to clear during these times, any fauna species identified during the pre-clearing survey will be relocated.
	9.3	Implement a feral baiting and/ or trapping program, consistent with the existing feral animal control strategy	Prior to clearing	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	9.4	Spread all cleared native vegetation in revegetation areas.	Following clearing if areas available, otherwise the revegetation area available.	No amendment proposed.
	9.5	Re-site hollow-bearing trees removed where practicable.	During clearing	No amendment proposed.
	9.6	Continue the existing feral animal management program.	Continuous	No amendment proposed.
	9.7	Inspect TSF 3 and the Rosedale Borrow Pit daily for fauna during the course of daily maintenance and operation inspections.	Daily	No amendment proposed.
	9.8	Progressive and final rehabilitation will occur across the Project Site to recreate a final land use of agriculture and native vegetation.	As required	No amendment proposed.
	9.9	Continue current programs of habitat enhancement and revegetation across the Proponent's land.	Ongoing	No amendment proposed.
	9.10	Review the revegetation program to ensure it remains relevant.	Annually	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	9.11	Ensure all native trees and shrubs planted on the Project Site are local endemic species.	Ongoing	No amendment proposed.
	9.12	Prepare and implement a detailed revegetation plan for the Limestone National Forest offset area.	Within 6 months of the grant of a planning approval.	No amendment proposed.
	9.13	Incorporate in the Mine Closure Plan details of the mechanisms to achieve long term security of both remnant and planted native vegetation across the Proponent's landholding.	No later than 3 years prior to the scheduled closure of the mine.	No amendment proposed.
	9.14	Undertake pre-clearing surveys to target Threatened species known to potentially occur in the vicinity of the Project Site. Undertake appropriate measures for the relevant species in the event any of the targeted species are located in an area to be cleared.	Prior to each tree clearing campaign.	No amendment proposed.
	9.15	Ensure that during all operations involving the clearing of mature trees, an ecologist or appropriately trained personnel is present to check any tree felled for wildlife inhabiting these trees.	During each tree felling campaign.	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	9.16	Undertake a small scale vegetation survey across the 6,000ha of surrounding properties owned by the Proponent to provide guidance on a suite of species appropriate for rehabilitation.	Within 2 years of E48 approval.	No amendment proposed.
	9.17	Swap an area of 45ha (as identified in Figure F1 of the E48 Environmental Assessment) in agreement with the DPI Forests for 24 ha located within the E48 subsidence zone.		No amendment proposed.
	9.18	Prepare, seed, plant, monitor and maintain (including weed control) in order to revegetate the offset area.	Ongoing.	No amendment proposed.
	9.19	Ensure revegetation of offset area involves the use of local native species, sourced locally.	Ongoing.	No amendment proposed.
	9.20	Prepare and implement a Construction Environmental Management Plan (CEMP) for Estcourt TSF construction.	Within 6 months of the grant of planning approval.	Amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	9.21	Additional Action	Within 12 months of the granting of planning approval.	Develop an offsets strategy in consultation with DECC that would: ◗ Identify lands containing the areas of vegetation communities listed in **Figure 19** of the Section 75W EA and ensure they are managed for conservation under secure tenure, in perpetuity, either in the NPWS Estate or under a VCA, or equivalent; or ◗ Agree to an alternative arrangement with DECC that would ensure an equivalent, or better, biodiversity conservation outcome.
10. INDIGENOUS HERITAGE				
Employees who are sensitive to, and respectful of, possible Aboriginal heritage on the Project Site.	10.1	Inform relevant staff and contractors of their responsibilities under the National Parks and Wildlife Act 1974.	During site induction	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
Appropriate salvage or protection provided for archaeological sensitive sites.	10.2	Implement the following proposed actions: (see table 10.2 Action below)	Salvage prior to surface disturbance in that area. Protect continually.	Implement the following proposed actions: (see table 10.2 Additions below)
	10.3	For those sites that require salvaging, the artefacts will be recovered as part of a salvage project that will be undertaken with the Peak Hill Local Aboriginal Land Council. The salvage work will be undertaken by a qualified archaeologist and members of the Land Council.	When programmed	No amendment proposed.

10.2 Action:

Site Id	Type	Impact	Proposed Action
2	Campsite	None	Protect
8	Campsite	Farming	Salvage
9	Campsite	Farming	Salvage
10	Campsite	Farming	Salvage
11	Campsite	Farming	Salvage
12	Campsite	Farming	Salvage
P1	Scarred Tree?	E48 Project	Salvage
P2	Isolated Find	E48 Project	Salvage
P3	Isolated Find	E48 Project	Salvage
P4	Isolated Find	E48 Project	Salvage
A1	Campsite	Farming	Salvage
A2	Isolated Find	E48 Project	Salvage
A3	Isolated Find	E48 Project	Salvage

10.2 Additions or alterations:

Site Id	Type	Impact	Proposed Action
2	Campsite	None	Protect
8	Campsite	Farming	Salvage
9	Campsite	Farming	Salvage
10	Campsite	Farming	Salvage
11	Campsite	Farming	Salvage
12	Campsite	Farming	Salvage
P1	Scarred Tree?	E48 Project	Salvage
P2	Isolated Find	E48 Project	Salvage
P3	Isolated Find	E48 Project	Salvage
P4	Isolated Find	E48 Project	Salvage
A1	Campsite	Farming	Salvage
A2	Isolated Find	E48 Project	Salvage
A3	Isolated Find	E48 Project	Salvage
NPM-ST1	Scarred Tree	Estcourt TSF	Record and prepare cast of tree

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
Minimise disturbance to potential unidentified sites.	10.4	Conduct a program of test pitting in Zone 1 (Goonumbla Creek).	Prior to any disturbance in Zone 1.	No amendment proposed.
	10.5	Additional Action	Prior to Estcourt TSF Construction	Revise AHMP to include reference to the identified Aboriginal site NPM-ST1 and the implementation of management measures.
	10.6	Additional Action	During topsoil removal at location of surface crushers	Involve local Wiradjuri representative to monitor removal of topsoil material within Zone 1 (Goonumbla Creek).
11. EUROPEAN HERITAGE				
Ensure appropriate records of the heritage buildings are made prior to their demolition.	11.1	A site plan of the heritage area be recorded to include: ◗ detailed recording of historic landscaping features; and ◗ location of structures within the Project Site and in relation to one another	Prior to disturbance	No amendment proposed.
	11.2	Record elevations of: ◗ Blacksmith's shed; and ◗ Workman's Hut.	Prior to disturbance	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	11.3	Compilation of the above details with the documentation and recordings provided by Jolly (2005).	Prior to disturbance	No amendment proposed.
12. VISUAL				
Limit adverse visual impacts	12.1	Progressively revegetate all project-related components.	As areas are finalised	No amendment proposed.
	12.2	Maintain site in clean and tidy manner.	Continuous	No amendment proposed.
13. ENVIRONMENTAL MONITORING				
Identification of the level of impact(s) (if any) the NPM operations is having on the surrounding environment.	13.1	Monitor noise at the principal residence (if occupied) 'Hubberstone', "Avondale", 'Milpose' and "Lone Pine."	Within 2 weeks of the start of each TSF construction program	No amendment proposed.
	13.2	Monitor blasts at 'Hubberstone'.	Every blast in E22 open cut	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
	13.3	Monitor PM_{10} levels at ‘Milpose’ and ‘Hubberstone’.	6 day cycle	No amendment proposed.
	13.4	Monitor deposited dust levels at 11 sites.	Monthly	No amendment proposed.
	13.5	Monitor surface water quality at existing sites and all new structures associated with E48 Project activities.	Separate schedule	Monitor surface water quality at existing sites and all new structures associated with E48 Project activities and Estcourt TSF.
	13.6	Monitor groundwater levels and quality in monitoring bore network.	Separate schedule	No amendment proposed.
	13.7	Monitor pH / EC of water pumped from E48 mine.	Daily	No amendment proposed.
	13.8	Review monitoring parameters and frequency to ensure meaningful data is collected.	Annually	No amendment proposed.
14. COMMUNITY RELATIONSHIPS				
Minimise impact on surrounding land users.	14.1	Maintain a substantial buffer zone (beyond the Project Site) surrounding the current and proposed mining operations.	Continuous while surface operations take place.	No amendment proposed.

Desired Outcome		Action	Timing	Additions or alterations arising from the Section 75W Modification
Keep surrounding land owners and land users informed about site activities.	14.2	Continue current practice of regular meetings and one-to-one liaison.	Ongoing	No amendment proposed.
Continue to enhance community communication.	14.3	Create a community consultative committee comprising mine management and local community representatives in order to enhance feedback between the mine and the local community on matters of community significance.		No amendment proposed.
15. DOCUMENTATION				
A systematic set of documents are in place to guide the planning and implementation of all environmental management strategies.	15.1	Incorporate the E48 Project management measures into the existing EMS.	Prior to commencement of the E48 Project and continuous review	No amendment proposed.
	15.2	Update the Mining Operations Plan for the mine site.	Prior to commencement of E48 and Estcourt TSF construction activities	Amendment to timing to include Estcourt TSF

Desired Outcome	Action		Timing	Additions or alterations arising from the Section 75W Modification
	15.3	Incorporate relevant data/information regarding the E48 Project in Annual Environmental Management Reports.	Annually	No amendment proposed.
16. MINE DECOMMISSIONING				
Decommission the mine and related infrastructure with least impact on the local environment and Parkes and district community.	16.1	Undertake all mine decommissioning in accordance with an approved Mine Closure Plan	Complete the mine closure plan no later than 3 years prior to scheduled closure of the mine	No amendment proposed.
	16.2	Prepare a memorandum of understanding with Parkes Shire Council regarding water allocations currently used by the NPM operations.	As required but prior to mine closure	No amendment proposed.
	16.3	Negotiate with Parkes Shire Council regarding programs for retraining personnel and social impacts following mine closure.	Prior to mine closure	No amendment proposed.

7. Justification / evaluation of the project

7.1. Evaluation of the project

7.1.1. Introduction

The decision as to whether to approve the subject modification to the existing development consent will need to balance the negative impacts arising from the proposal against the positive benefits that the modification will bring in terms of socioeconomic activity in the region.

7.1.2. Biophysical Considerations

The proposed NPM Section 75 modification would result in impacts on native flora and fauna, including:

- Clearing of approximately 14.3 ha of native vegetation including threatened fauna habitat;
- Clearing of TSC Act listed Endangered Ecological Communities (EECs);
- Removal of habitat resources including remnant native vegetation, and hollow bearing trees; and
- 'Likely' significant negative effects on local populations of the *TSC Act* listed Grey-crowned Babbler.

A commitment to develop an offset strategy is proposed to accompany the Section 75W modification application in order to satisfy the requirements of the DEC/DPI (2005) guidelines and Part 3A of the EP&A Act. This offsets strategy forms part of the draft SOCs for the proposed activity and would be included in the Conditions of Project Approval.

7.1.3. Socio-Economic Considerations

The proposed modifications are justified by the Proponent in terms of its economic and social benefit to the Parkes, regional and State communities. Up to 350 regular jobs, with the considerable indirect employment in the Parkes Shire and elsewhere, provides a substantial contribution to social equity.[22]

7.2. Project justification

The predicted residual impacts attributable to the proposed modifications are justified in terms of the absence of any long-term major impacts and the fact that the Proponent's commitments would minimise the impacts.

The landscape around the Project Site would continue to change throughout the remaining life of the NPM operations.

[22] Corkery and Associates (2006)

However, the Proponent's planning and commitment to rehabilitation would contribute to the productive use of much of the land within the Project Site. In addition to the biophysical changes already discussed, the modification is justified in terms of its economic and social benefits identified in Section 7.1.3.

7.3. Consequences of not proceeding

As with the E48 project, should the modification not proceed the following consequences would occur:

- The biophysical impacts discussed would not occur; and
- The economic and social benefits identified would also not eventuate. The outcomes of such impacts would be felt, particularly throughout the Parkes and district community [23].

The argument thus carries over to the modification proposal in that although impacts are known (and in the case of ecology potentially significant), the decision needs to be balanced against the economic and social benefits to the region should the modification not proceed.

7.4. Conclusion

This environmental assessment has considered the potential impacts of the proposed modification to the E48 Project at Northparkes Mines near Parkes, NSW.

The environmental assessment has been prepared by GHD on behalf of North Mining Limited to assist the Minister of Planning in assessing the proposal.

This environmental assessment has been prepared in accordance with Part 3A of the EP&A Act to assess the potential environmental impacts associated with the proposal. The provisions of the *State Environmental Planning Policy 2005 (Major Projects)* apply to the proposal.

The environmental assessment provides an assessment of the potential environmental impacts of the proposal in accordance with the DGRs issued on 26 September 2008.

Environmental investigations were undertaken during the preparation of the environmental assessment to assess the potential environmental impacts. These included specialist assessment on issues involving potential environmental impacts on flora and fauna; heritage; soils and water; traffic and transport; and air quality and noise.

The proposed works have been sited within an area identified as being the best available location for the proposal.

The environmental assessment has documented the potential environmental impacts associated with the proposal, considering both potential positive and negative impacts of the proposal, and recommends management measures to protect the environment

[23] Corkery and Associates (2006)

where required. The main potential impacts requiring environmental management include:

- Direct and indirect ecological impacts from vegetation clearing during construction, and indirect ecological impacts during operation;
- Maximising water efficiency of the NPM operations;
- Aboriginal heritage;
- Adherence to air quality criteria; and
- Adherence to noise criteria.

The proposal includes a number of measures to mitigate the potential environmental impacts. These measures would be implemented by a construction environment management plan for the Estcourt TSF and existing operational environmental management plans. These plans would also ensure compliance with relevant legislation and conditions of approval.

The E48 EA conclusion is considered to remain valid in that–

"From a social and economic perspective, the approval and operation of the E48 Project would continue to provide positive benefits, particularly to the Parkes and district community"[24]

[24] Corkery and Associates (2006)

8. References

Australian Tailings Consultants, August 2000, *Report on Study of E22 In-pit Tailings Disposal for Northparkes Mines* Ref.: 99017R021.wpd,

Corkery, RW and Associates, 2006, *Environmental Assessment Northparkes Mines – E48 Project*

CSIRO, 1997a, *Minesite Rehabilitation Research Program Characterisation of No. 1 Tailings Dam, Final Report, Stage 1, for Northparkes Mines*, March 1997

CSIRO, 1997b, *Minesite Rehabilitation Research Program Characterisation of No. 1 Tailings Dam, Final Report, Stage 2, for Northparkes Mines*, May 1997

DECC, August 2005, *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*

DECC, 2008, Managing Urban Stormwater - Soils and Construction Volume 2E: Mines and quarries

Environmental Geochemistry International (EGI), February 1996, *Geochemical Evaluation of Tailings within the Northparkes Mines Tailings Storage* Ref. 2004-2/257

Geoff Cunningham Natural Resource Consultants (2006) *Soils Survey and Land Capability Assessment of the Northparkes Mines - E48 Project*

Heggies Australia Pty Ltd, August 2006, *Northparkes Mines – E48 Project Air Quality Assessment*

Knight Piésold Pty Ltd (2008), *Northparkes Mines Tailings Management Feasibility Study: Life of Mine Tailings Storage*, Ref.:PE801-00008/8

Northparkes Mines, August 2007, *Sitewide Water Management Plan*

Northparkes Mines, August 2008, *Northparkes Mines Mine/Mill Expansion Pre-Feasibility Study*, Internal Report

NSW Department of Environment and Climate Change, 2005 *Guidelines for Threatened Species Assessment*

Parsons Brinkerhoff (2003) *In-Pit Tailings Disposal, Hydrogeology Investigation and Groundwater Impact Assessment*

Transport and Urban Planning (August 2006) *Traffic Assessment of the Northparkes Mines – E48 Project*, Sutherland NSW.

WRM Water & Environment Pty Ltd, 2006 *Surface Water Assessment of the Northparkes Mines - E48 Project*

Appendix A

DGRs and Agency Correspondence

NSW GOVERNMENT
Department of Planning

Contact: Kane Winwood
Phone: (02) 9228 6298
Fax: (02) 9228 6466
Email: kane.winwood@planning.nsw.gov.au

Our Ref: 9036747

Mr Craig Stegman
General Manager, E48 Project
Northparkes Mines
PO Box 995
PARKES NSW 2870

Dear Mr Stegman

Director General's Requirements
Northparkes Mine
Application No: 06-0026 Mod 1

I refer to your request to modify the Minister's approval for the Northparkes Mine (06-0026), under Section 75W of the *Environmental Planning & Assessment Act 1979* (EP&A Act).

I have attached a copy of the Director-General's requirements for the environmental assessment of the proposed modification. These requirements are based on the information you have provided to date.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit your Environmental Assessment for the proposed modification. This will enable the Department to determine the:

- applicable fee (see Division 1A, Part 15 of the *Environmental Planning and Assessment Regulation 2000*); and
- number of copies (hard-copy or CD-ROM) of the Environmental Assessment that will be required for consultation purposes.

These requirements will be placed on the Department's website along with other relevant information which becomes available during the assessment of the proposed modification. As a result, I would appreciate it if you would ensure that any subsequent documents submitted to the Department are in a suitable format for the web.

If you have any enquiries about these requirements, please contact Kane Winwood on 9228 6298.

Yours sincerely

DKitto
26/9/08

David Kitto
A/Executive Director
Major Project Assessment
As delegate of the Director-General

Director-General's Requirements

Section 75W of the *Environmental Planning and Assessment Act 1979*

Application number	06-0026 MOD 1
Proposed Modification	The proposal involves: • increasing the maximum processing rate; and • constructing a new Tailings Storage Facility and associated infrastructure.
Location	Northparkes Mine, 27km north-northwest of Parkes, NSW
Proponent	North Mining Ltd
Date of Issue	26 September 2008

General Requirements	The Environmental Assessment must include:
	• a summary of the existing and approved mining operations, including any relevant statutory approvals, and the existing environmental management and monitoring regime at the mine;
	• a detailed description and justification of the proposed modification;
	• a risk assessment of the potential environmental impacts of the proposed modification, identifying the key issues for further assessment;
	• a detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes:
	  - a description of the existing environment;
	  - an assessment of the potential impacts of the proposed modification, including any cumulative impacts, taking into consideration any relevant guidelines, policies, plans and statutory provisions (see below);
	  - a description of the measures that would be implemented to avoid, minimise, mitigate, rehabilitate/remediate, monitor and/or offset the potential impacts of the proposed modification;
	• a statement of commitments, outlining all the proposed environmental management and monitoring measures;
	• a conclusion justifying the proposed modification on economic, social and environmental grounds, taking into consideration whether the proposed modification is consistent with the objects of the Environmental Planning & Assessment Act 1979; and
	• a signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading.

Key Issues	• **Soil and Water** - including consideration of the potential impacts if the proposed tailings paste plant is not constructed; • **Biodiversity**; • **Noise and Vibration**; • **Air Quality**; • **Transport**; • **Aboriginal Heritage**; and • **Rehabilitation** – including a detailed revision of the mine's existing rehabilitation strategy.
References	The environmental assessment of the key issues listed above must take into account relevant guidelines, policies, and plans. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this proposed modification.

Consultation	During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth government authorities, service providers, community groups or affected landowners. In particular, you should consult with: • Parkes and Forbes Shire Councils; • Department of Environment and Climate Change; • Department of Primary Industries; • Department of Water and Energy; • Dams Safety Committee; and • Northparkes Community Consultative Committee The consultation process and the issues raised must be described in the Environmental Assessment.

Policies, Guidelines & Plans

Aspect	Policy /Methodology
Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
	Risk Management Handbook for the Mining Industry (DPI)
Soil and Water	
Soil	Rural Land Capability Mapping (DLWC)
	Agricultural Land Classification (DPI)
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC & NHMRC)
	National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC)
	Draft Guidelines for the Assessment & Management of Groundwater Contamination (DECC)
	Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land (DOP)
Surface Water	National Water Quality Management Strategy: Water quality management - an outline of the policies (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Policies and principles - a reference document (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Implementation guidelines (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)
	State Water Management Outcomes Plan
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)
	Drinking Water Catchments Regional Environmental Plan No. 1
	Managing Urban Stormwater: Soils & Construction (Landcom)
	Floodplain Management Manual (DNR)
Groundwater	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	NSW State Groundwater Policy Framework Document (DLWC)
	NSW State Groundwater Quality Protection Policy (DLWC)
	NSW State Groundwater Quantity Management Policy (DLWC) Draft
Biodiversity	
	Draft Guidelines for Threatened Species Assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (DEC)
	NSW Groundwater Dependent Ecosystem Policy (DLWC)
Noise	
	NSW Industrial Noise Policy (DECC)
	Environmental Criteria for Road Traffic Noise (DECC – EPA)
	Environmental Noise Control Manual (DECC)

Air Quality	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DECC)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DECC)
Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RTA)
Aboriginal Heritage	
	Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC)
Rehabilitation	
	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)
	Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)

NSW Government
Department of Water & Energy

Mr Craig Stegman
General Manager E48 Project
North Parkes Mines
PO Box 995
PARKES NSW 2870

Contact: Tim Baker
Phone: (02) 6841 7403
Fax: (02) 6884 0096
Email: Tim.Baker@dnr.nsw.gov.au

File: ER20351

6 November 2008

Dear Mr Stegman

Subject: NORTH PARKES MINE – MODIFICATION APPLICATION 06_0026 Mod 1 – ENVIRONMENTAL ASSESSMENT REQUIREMENTS

I refer to a meeting with North Parkes Mine staff regarding the above mentioned modification application at the Department of Water and Energy's (DWE) Dubbo office on 3 November 2008. Based on the information supplied to DWE at that meeting, the following submission details DWE's environmental assessment requirements for the proposed additional tailing storage facility, increase in ore processing rate and increase in water supply demand.

Key Issues

DWE requires the Environmental Assessment (EA) for the proposal to demonstrate the following:

1. Adequate and secure water supply for the proposal. In the situation of accessing water via infrastructure or licences held by other parties, DWE would expect an indication of support by the other party and details of the associated licences. Whilst it is recognised that a potential arrangement for water supply between Council and the applicant is not the responsibility of DWE it needs to be recognised that the availability of this water may be subject to the existing TWS entitlement and accompanying allocation held by Council's licence within the Lachlan Regulated River Water Source or licences under the *Water Act 1912*. The applicant is therefore advised that the availability of this supply needs to be demonstrated.

2. Identification of site water demands, water sources (surface and groundwater), water disposal methods and water storage structures in the form of a water balance. This is to also include details of any water reticulation infrastructure that supplies water to the site.

3. Proposed water management on the site based on the site water balance with specific reference to the existing and proposed extraction, storage and transfer of groundwater and surface water either for consumptive or incidental purposes.

4. Existing and proposed water licensing requirements in accordance with the *Water Act 1912*, *Water Management Act 2000* and NSW Inland Groundwater Water Shortage Zones Order No. 1 & 2, 2008. This is to demonstrate that existing licences (include licence numbers and entitlements) are appropriate and to identify where additional licences are required. The applicant is advised that water entitlements in excess of existing entitlements available to the mine would need to be purchased on the open market. DWE has no capacity to make water available for the project.

5. An assessment of impact on adjacent licensed water users (surface and groundwater), basic landholder rights, and surface and groundwater-dependent ecosystems in terms of

both water quality and quantity. This is to address the impacts in the zone of influence of the mine site in addition to the zone of influence of the water sources by the propose infrastructure and increase in water demand.

6. An impact assessment of the construction, operation and final landform of the proposed tailing storage facility to meet the requirements of the NSW State Groundwater Policy framework document.

7. Adequate mitigating and monitoring requirements to address surface and groundwater impacts. This is to include a revision of the existing groundwater and surface water monitoring plan for the site, and the bore impact management plan.

A general list of environmental assessment requirements to be addressed in the EA is provided in Attachment 1.

DWE advises the project site is located within the Lachlan Fold Belt Groundwater Management Area 811, and the water supply bores near the Lachlan River are located within the Upper Lachlan Alluvium Groundwater Management Area 011. These two GWMA's are covered by the NSW Inland Groundwater Shortage Zones Order No. 2 and 1 respectively under the *Water Act 1912*. The embargo places restrictions on groundwater interception and exemptions for groundwater access and interference which will need to be considered in the EA where modifications to existing licences and new licences are proposed.

State Government Technical and Policy Documents

The proposal must address the NSW State Government natural resource management policies, as applicable. Policies to include but not to be limited to:

Relevant Policy

NSW Inland Groundwater Shortage Zones Order No. 1 & 2 (2008)

NSW State Groundwater Policy Framework Document (1997)

NSW State Groundwater Quantity Management Policy (1998)

NSW State Groundwater Quality Protection Policy (1998)

NSW State Groundwater Dependent Ecosystems Policy (2002)

Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)

Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (2000)

Guidelines for the Assessment and Management of Groundwater Contamination (2007)

Guidelines for Groundwater Protection in Australia (1995)

MDBC Guidelines on Groundwater Model Development

The Department has provided this information to assist in the development of a comprehensive environmental assessment of the proposed development. For general enquires please contact Tim Baker on (02) 6841 7403, for water licensing information please contact Viv Russell on 6850 2801 and for the groundwater assessment please contact Madhwan Keshwan on 6841 7411.

Yours sincerely

Tim Baker
Planning Coordinator - Central

ATTACHMENT 1 – ENVIRONMENTAL ASSESSMENT REQUIREMENTS

General Environmental Risk Analysis – the EA must include the following for all water-related aspects of the proposal:

- an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation);
- proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures; and
- where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of these additional key environmental impacts must be included in the EA.

Key issue: Water supply and water balance

The EA must include assessment of water supply and/or water interception and extraction against any Water Sharing Plan in force affecting the site or potential water supply to the proposal. A full description of water supply to all stages of the proposal must be included, which includes:

- water source(s) which may be used to supply water to the proposal, additional water requirements, and a checklist against any regulatory water sharing or other ministerial plans or other instruments applying to that water source
- explanation of any embargoes or full commitment declarations for the proposal, and any identified means to source water supply for the proposal
- examination of reliability of water supply to the proposal, including alternatives to site rainfall runoff harvesting in the event of drought
- demonstration of priorisation and effective reuse of saline or other contaminated water within the proposal
- explanation of water circuitary and means to segregate contaminated, sediment-laden and clean water volumes within the proposal and proposal site. This would require development of surface water management plan.

Key Issue: Groundwater Resource Protection

• **Groundwater** – the EA must include demonstration that the project is consistent with the principles of the NSW State Groundwater Policy Framework Document, the NSW State Groundwater Quality Protection Policy, the NSW State Groundwater Dependent Ecosystems Policy and the Draft NSW State Groundwater Quantity Management Policy. This must include, for the pre-, during, and post- development phases of the project the following:

- identification of surrounding water users and any groundwater dependent ecosystems;
- detailed explanation of potential groundwater volume, piezometric level, water table heights and the direction of flow and quality, through mine life and projections into the post-mine period, any identified connected water sources impacted by extraction
- detailed explanation of groundwater drawdown or other impacts upon connected groundwater.
- explanation of the site water balance for the proposed extension and total site operations, including any changes to water balance inputs from rainfall runoff and/or groundwater seepage/interception;
- detailed description of any proposed water supply system utilising groundwater as a source, and identification of licensing requirements;

- detailed analysis of the impacts of dewatering if required for the project, identifying the magnitude and duration of pumping, the areal extent of water level drawdown, the likely quality of extracted groundwater, alterations to site water balance, and the monitoring and reporting protocols to be adopted to meet licensing requirements;
- measures to prevent contamination of the groundwater.
- identification of potential and likely groundwater-dependent ecosystems, and any impact upon these ecosystems which may result from the proposal; this must include
    - Terrestrial vegetation with seasonal or episodic reliance on groundwater, and
    - Aquatic and riparian ecosystems in, or adjacent to, streams or rivers dependent upon the input of groundwater to minimum base flows

Key Issue: Landform or Void Rehabilitation

Rehabilitation, Final Landform and Final Void Management – the EA must include:

- justification of the proposed final landform with regard to its impact on local and regional groundwater systems and surface water systems;
- a detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape;
- detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent;
- a detailed description of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and
- the measures that would be established for the long-term protection of local and regional aquifer and surface water systems and for the ongoing management of the site following the cessation of the project.

cc Renee
→ file
S

Your reference :
Our reference : LIC07/80-04 DOC08/46762
Contact : Kharl Turnbull, (02) 6883 5333

Mr Steve Alexander
Manager Environment, Safety, Health & Community
Northparkes Mines
PO Box 995
PARKES NSW 2870

7 October 2008

Dear Mr Alexander

I refer to the site inspection undertaken by the Department of Environment and Climate Change (DECC) on the 24 August 2008 of the Nothparkes Mine.

Please note that DECC exercises certain statutory functions and powers in the name of the Environment Protection Authority (EPA).

Additionally, I note the email correspondence from Renee Morphett of Nothparkes Mine on 1 October 2008 which included the Department of Planning's (DoP) Director General Requirements (DGRs) for the Northparkes Mine Application No: 06- 0026 Mod 1.

As discussed on the 24 August 2008, DECC also administers the *Native Vegetation Act 2003*. Consequently, Northpakes Mines should ensure that the Environmental Assessment (EA) for the project also consider the measures to avoid, minimise, mitigate and/ or offset the impacts of the proposal on native vegetation. Hence the EA should address all vegetation communities to be impacted and not just Ecological Endangered Communities.

Should you have any further enquiries please do not hesitate to contact Kharl Turnbull at the Dubbo Office of the DECC by telephoning (02) 68835333.

Yours sincerely

CARMEN DWYER
Head Pesticides, Operations and Planning Dubbo
<u>Environment Protection and Regulation Group</u>

cc. Mr Kane Winwood, Major Project Assessment, Department of Planning, GPO Box 39, SYDNEY NSW 2001

The Department of Environment and Conservation NSW is now known as
the Department of Environment and Climate Change NSW

PO Box 2111, Dubbo NSW 2830
48- 52 Wingewarra Street, Dubbo NSW 2830
Tel: (02) 6883 5333 Fax: (02) 6884 8675
ABN 30 841 387 271
www.environment.nsw.gov.au

Department of **Environment and Conservation** NSW

11 November 2008

Our ref: 06/6568

Ms Renee Morphett
Northparkes Mines
PO Box 995
PARKES NSW 2870

Dear Renee

NORTHPARKES MINES
MODIFICATION TO DEVELOPMENT CONSENT 06-0026

Thank you for your presentation on 5 November 2008 detailing the proposed Estcourt Tailings Storage Facility modification to the E48 Project at Northparkes Mine located near Parkes.

Following a review of your proposal the Department of Primary Industries provides the following comments on key issues relevant to the Department in consideration of an *Environmental Assessment*.

Groundwater and Surface Water

The Company will need to address surface water and groundwater impacts and mitigation measures to be undertaken to support the application for modification. The project will need to demonstrate that inpit tailings deposition in E27 will not cause long term groundwater. Surface water impact will also need to be covered ensuring that no long term seepage will affect local watercourses located in close proximity to the site.

Location, Design and Visual Amenity

The site will need to satisfy the Department that no resource sterilisation will occur due to the deposition of tailings within this footprint area of the mine site.

The Tailings Storage Facility design features will also need to be documented to ensure long term stability of the structure following mine closure. This will need to describe the type of tailings dam to be constructed and quality management during construction.

Visual Impacts will need to also be described and how the dam will not impinge on the intrinsic aesthetics of the surrounding area.

Rehabilitation and Monitoring

A rehabilitation strategy should be included in the overall rehabilitation strategy for the site. The angle of slopes, the type of cover design and surface water management needs to be described for the tailings storage facility. Revegetation and medium used will need to be covered to ensure satisfactory regrowth of the area that is consistent with the surrounding landuse in the area.

Mine Closure
The final end land use for the structure will need to be documented in keeping with the overall mine closure strategy for the site.

The Company will need to provide an updated Mining Operations Plan to the Department before commencement of any activities. An Annual Environmental Management Report will also required reporting against the commitments documented within the Mining Operations Plan.

If you have any queries please contact Kay Oxley, Regional Environmental Officer on 6360 5359.

Yours faithfully

K Oxley

Kay Oxley
REGIONAL ENVIRONMENTAL OFFICER

Appendix B

Noise and Vibration Assessment

CLIENTS | PEOPLE | PERFORMANCE

North Mining Limited

Section 75W Modification for Northparkes Mines

Noise and Vibration Impact Assessment

January 2009

Revision 1

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Figure Index

Appendices

Glossary

dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
L_N	Statistical sound measurement recorded on the linear scale.
L_{AN}	Statistical sound measurement recorded on the "A" weighted scale.
$L_{A10\ (Time)}$	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
$L_{A10\ (1\ hour)}$	The L_{10} level measured over a 1-hour period.
$L_{A10\ (18\ hour)}$	The arithmetic average of the L_{10} levels for the 18-hour period between 0600 and 2400 hours on a normal working day. It is a common traffic noise descriptor.
$L_{Aeq\ (Time)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{Aeq\ (15\ hr)}$	The L_{Aeq} noise level for the period 7 am to 10 pm.
$L_{Aeq\ (9\ hr)}$	The L_{Aeq} noise level for the period 10 pm to 7 am.
$L_{Aeq\ (1\ hr)}$	The L_{Aeq} noise level for a one-hour period. In the context of the NSW DECC *Environmental Criteria for Road Traffic Noise*, it represents the highest tenth percentile hourly A-weighted L_{eq} during the period 7 am to 10 pm, or 10 pm to 7 am, (whichever is relevant). If this cannot be defined accurately, the highest A-weighted L_{eq} noise level is used.
$L_{A90\ (Time)}$	The A-weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90\ (15\ min)}$.
$L_{AMax\ (Time)}$	The maximum sound level recorded during a specified time interval.
$L_{AMin\ (Time)}$	The minimum sound level recorded during a specified time interval.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. This is the level used for assessment purposes. It is defined as the median value of: All the day assessment background levels over the monitoring period for the day; All the evening assessment background levels over the monitoring period for the evening; or All the night assessment background levels over the monitoring period for the night.

Executive Summary

GHD has been engaged by North Mining Limited to prepare a Noise and Vibration Impact Assessment for the proposed Section 75W Modification to the Northparkes Mines (NPM) operations, near Parkes NSW.

North Mining Limited seeks to increase the operational capacity of the mine and improve tailings management by introducing an expanded process and a new tailings storage facility. The proposed modifications include:

- Construction of a new tailings storage facility ("Estcourt" TSF) including any associated floor preparation and drainage system;
- Increase the limit on approval from 6.5 million tonnes of ore per year to 8.5 million tonnes of ore per year processed;
- Extend the life of the mine through 2025 through more efficient mining of the E48 resource;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations;
- Upgrades and modifications to existing processing infrastructure including:
  - Module 1 and 2 Grinding Circuits;
  - Module 1 and 2 Flotation Circuits;
  - Module 3 Flotation Circuit;
  - Concentrate Handling Facilities; and
  - Tailings Handling Facilities.

This assessment has been conducted with consideration to the following NSW Department of Environment and Climate Change (DECC) Noise Policies:

- Industrial Noise Policy (INP);
- Environmental Noise Control Manual (ENCM), Chapter 19; and
- New South Wales Construction Noise Guidelines: Draft for consultation (August 2008).

Section 1.4 of this report outlines the noise limits as specified in the Northparkes Mine Specific Environmental Conditions of the Condition of Approval (CoA) and the Statement of Commitments of the CoA.

Predicted noise levels from the Project Site operations following the proposed modifications show that the license limit of 35 dB(A) is expected to be met at all noise receivers under the modelled weather conditions.

A comparison of predicted noise results following the modifications to the existing and approved mining operations show increases in noise levels of up to 4 dB(A) at the nearest receivers, however remaining compliant with the 35 dB(A) noise goal. These increases are primarily experienced at receivers 'Milpose' and 'Lone Pine' and can be mainly attributed to the addition of the secondary and tertiary crushers near the underground operations portal area.

Noise levels during the construction of the “Estcourt” Tailings Storage Facility (TSF) show a potential 1 dB(A) exceedence of the nighttime noise goal at the ‘Lone Pine’ receiver, while noise levels at all other receivers are shown to comply under all modelled weather conditions. As a result of the potential exceedence, general recommendations for noise mitigation measures have been outlined in Section 6 of this report.

Predicted cumulative noise impacts from the proposed operations and construction of “Estcourt” TSF suggest compliance with the CoA noise limit of 35 dB(A) under all weather conditions at ‘Hubberstone’, ‘Avondale’ and ‘Milpose’. However, model results suggest a potential exceedence of up to 3 dB(A) above the nighttime noise goal at ‘Lone Pine’ receiver under weather enhancing conditions.

Based on the predicted increase in truck movements associated with the proposed increase in ore production, it is not expected that significant traffic noise impact on the local road network would occur.

Maximum received noise levels due to track dozer operation are expected to be under the 45 dB(A)L_1 sleep disturbance criteria at all identified receivers.

Predicted ground vibration and airblast levels are expected to be under the blast and vibration license limits at identified receivers.

Based on the information provided, assumptions made and the results of the assessment, it is considered that project specific noise goals may be achieved at the nearest potentially affected receivers based on the proposed mining operations. However, there is potential exceedance of the noise goals during construction of “Estcourt” TSF under adverse weather conditions. General mitigation measures have been recommended in Section 6 to minimise construction noise during these conditions.

1. Introduction

1.1 Background

Development Consent 06-0026 granted North Mining Limited approval under Part 3A of the Environmental Planning & Assessment Act 1979 to extend its underground gold/copper mine at Northparkes Mines (NPM). The approved project included:

- Continued use of existing infrastructure at the mine to a maximum capacity of 6.5 million tonnes of ore per year;
- Establishment of a new underground mine (E48) to extract up to 34 million tonnes of ore to 2018; and
- Construction and use of additional infrastructure, including the overland conveyor and Tailings Storage Facility 3.

North Mining Limited now seeks to increase the operational capacity of the mine and improve tailings management by introducing an expanded process and a new tailings storage facility. The relevant proposed modifications are hereafter referred to as the 'proposed works' and include:

- Construction of a new tailings storage facility ("Estcourt" TSF) including any associated floor preparation and drainage system;
- Increase the limit on approval from 6.5 million tonnes of ore per year to 8.5 million tonnes of ore per year processed;
- Extend the life of the mine through 2025 through more efficient mining of the E48 resource;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations;
- Upgrades and modifications to existing processing infrastructure including:
  - Module 1 and 2 Grinding Circuits;
  - Module 1 and 2 Flotation Circuits;
  - Module 3 Flotation Circuit;
  - Concentrate Handling Facilities; and
  - Tailings Handling Facilities.

The Northparkes Mines – E48 Project Noise and Blasting Assessment prepared by Heggies (August, 2006) forms the basis of this assessment and is hereafter referred to as the 'Heggies report'.

1.2 Scope of Work

GHD was engaged to provide a noise assessment of the potential impacts of the proposed works on the nearest sensitive receptors. The scope of work of the noise impact assessment was:

- Initial desk-top review to identify key environmental noise catchment areas and noise sensitive receivers from aerial & terrestrial photography and previous Northparkes Mines noise and vibration reports;
- Provision of a summary of the results of ambient noise monitoring recently conducted at residential locations surrounding Northparkes Mines by Heggies Australia Pty Ltd (Heggies)[1];
- Identification of the principal noise sources within the existing Northparkes Mines site and develop a noise model of the existing mining operations. This noise model was verified using Heggies noise monitoring data and noise predictions;
- Identification of the future noise sources proposed as part of the approval modification;
- Undertake noise modelling of two operational scenarios to account for different meteorological conditions (neutral and noise enhancing weather conditions) using CadnaA noise modelling software to predict operational sound pressure levels emanating from the mine with the proposed works. Noise modelling was undertaken with consideration to the Department of Environment and Climate Change's (DECC) NSW *Industrial Noise Policy* (INP);
- Assessment of predicted noise levels against Northparkes Mines Specific Environmental Conditions of the Condition of Approval (CoA) and the Statement of Commitments of the CoA;
- Provide recommendations for in-principle noise mitigation measures;
- Desktop assessment to predict blasting overpressure and vibration levels at identified receivers. Blasting overpressure and vibration level predictions were based on previous predictions made by Heggies[2];
- Identification and discussion of vibration issues at the most sensitive receivers and provision of in-principle advice on potential site vibration related issues; and
- Predictions of potential increases in road traffic noise using the Calculation of Road Traffic Noise (CoRTN) model with consideration to the DECC's *Environmental Criteria for Road Traffic Noise* (ECRTN).

1.3 Limitations

This report has been prepared for North Mining Limited. The purpose of the report is to provide an independent noise assessment of the proposed Section 75W modification to existing mining operations.

---

[1] Heggies Australia Limited, Northparkes Mines Mine Operation Noise Monitoring, September 2008.

[2] Heggies Australia Pty Ltd, Noise and Blasting Assessment of the Northparkes Mines – E48 Project, August 2006.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the noise assessment represent the findings apparent at the date and time of the monitoring and the conditions of the existing noise assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be accessed and all uncertainty concerning the conditions of the ambient noise environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

1.4 NPM Noise and Vibration Licence Conditions

The sections pertinent to noise and vibration of Schedule 3 Specific Environmental Conditions of the CoA and Appendix 3 Statement of Commitments of the CoA in relation to Northparkes Mines Development Consent 06-0026 are presented below.

1.4.1 Noise Impact Assessment Criteria

The Proponent shall ensure that the noise generated by the Project does not exceed 35 dB(A) $L_{Aeq(15minute)}$, or 45 dB(A) $L_{A1(1minute)}$ at any privately-owned residence.

Notes:

- *To determine compliance with the LAeq(15 minute) limit, noise from the Project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the development is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable;*
- *To determine compliance with the $L_{A1(1\ minute)}$ limit, noise from the Project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the Project is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy);*
- *The noise limits above apply under the following meteorological conditions:*
  - *Wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *Temperature inversion conditions of up to 3^{o}C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level; and*

- These limits do not apply if the Proponent has an agreement with the relevant owner/s of these residences to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

1.4.2 Blasting and Vibration

The proponent shall ensure that the airblast overpressure level from blasting at the Project does not exceed the criteria in Table 1 at any residence on privately-owned land.

Table 1: Airblast overpressure impact assessment criteria

115	*5% of the total number of blasts over a period of 12 months*
120	*0%*

The proponent shall ensure that the ground vibration level from blasting at the Project does not exceed the criteria in Table 1 at any residence on privately-owned land.

Table 2: Ground vibration impact assessment criteria

5	*5% of the total number of blasts over a period of 12 months*
10	*0%*

1.5 Traffic Noise Criteria

Due to the potential for the Section 75W Modification to create additional traffic levels, road traffic noise criteria may apply.

Road traffic noise criteria are sourced from the DECC's ECRTN. The ECRTN contains a number of criteria applied to residential receivers near roads, depending on the situation and the road classification. Situation 13 in the ECRTN applies to land use developments with potential to create additional traffic on existing collector roads and as such are applicable to the proposed development.

The ECRTN's category 8 is provided in Table 1-1.

Table 1-1 ECRTN Road Traffic Noise Criteria L_{Aeq}

8. Land use developments with potential to create additional traffic on collector roads	$L_{Aeq(1hr)}$ 60	$L_{Aeq(1hr)}$ 55	Where feasible and reasonable, noise levels from existing roads should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicle; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Based on information provided by NPM, predicted concentrate truck movements are expected to be low with 10 additional movements per week or 1-2 movements per day. As such, the increase in noise levels due to concentrate truck movements is expected to be negligible. Increase in noise levels due to additional concentrate truck movements is discussed further in Section 4.5.

2. Project Description

2.1 Project Site

NPM is located 27 km northwest of Parkes and 12 km northwest of Goonumbla in mid western NSW. The operating mine site covers an area of approximately 2500 hectares. Figure 2-1 shows the existing Project site, the approved areas under Development Consent 06-0026 and the proposed modifications as part of Section 75W.

2.2 Operating Hours

The hours of operation of the Project site are presented in Table 2-1.

Table 2-1 Hours of Operation

Site Activity	Hours of Operation
General mining operations including processing	24 hours, 7 days
Blasting (underground)	24 hours, 7 days
Blasting (open cut)	9.00 am to 5.00 pm, Monday to Saturday
Tailings Storage Facility Construction	24 hours, 7 days
Truck movements	24 hours, 7 days

Figure 2-1 Northparkes Mines Site and Section 75W Modifications

Insert Figure 1.pdf in PDF folder G:\21\17903\PDF's

2.3 Section 75W Modifications

The Heggies report assessed noise and blasting impacts for the approved extension of NPM through the E48 Project.

GHD understand that the proposed modification to Development Consent 06-0026 will include the addition of new equipment as well as alterations to existing equipment. The proposed modifications are detailed below in Table 2-2.

Table 2-2 Proposed Modifications

Existing	Proposed Modification
E22 Open Cut Mine	Continued operations
Ore Processing Plant (OPP)	New cyclone cluster near ML03
	New cyclone cluster near ML04
	New cyclone cluster near ML06
	New Flotation module
	New ML08
	New tailings thickener
	New filter in filter building
Underground Mine Portal	New Secondary Crusher
	New Tertiary Crusher

Figure 2-2 shows the layout of the proposed new equipment to be located in the existing Ore Processing Plant Area.

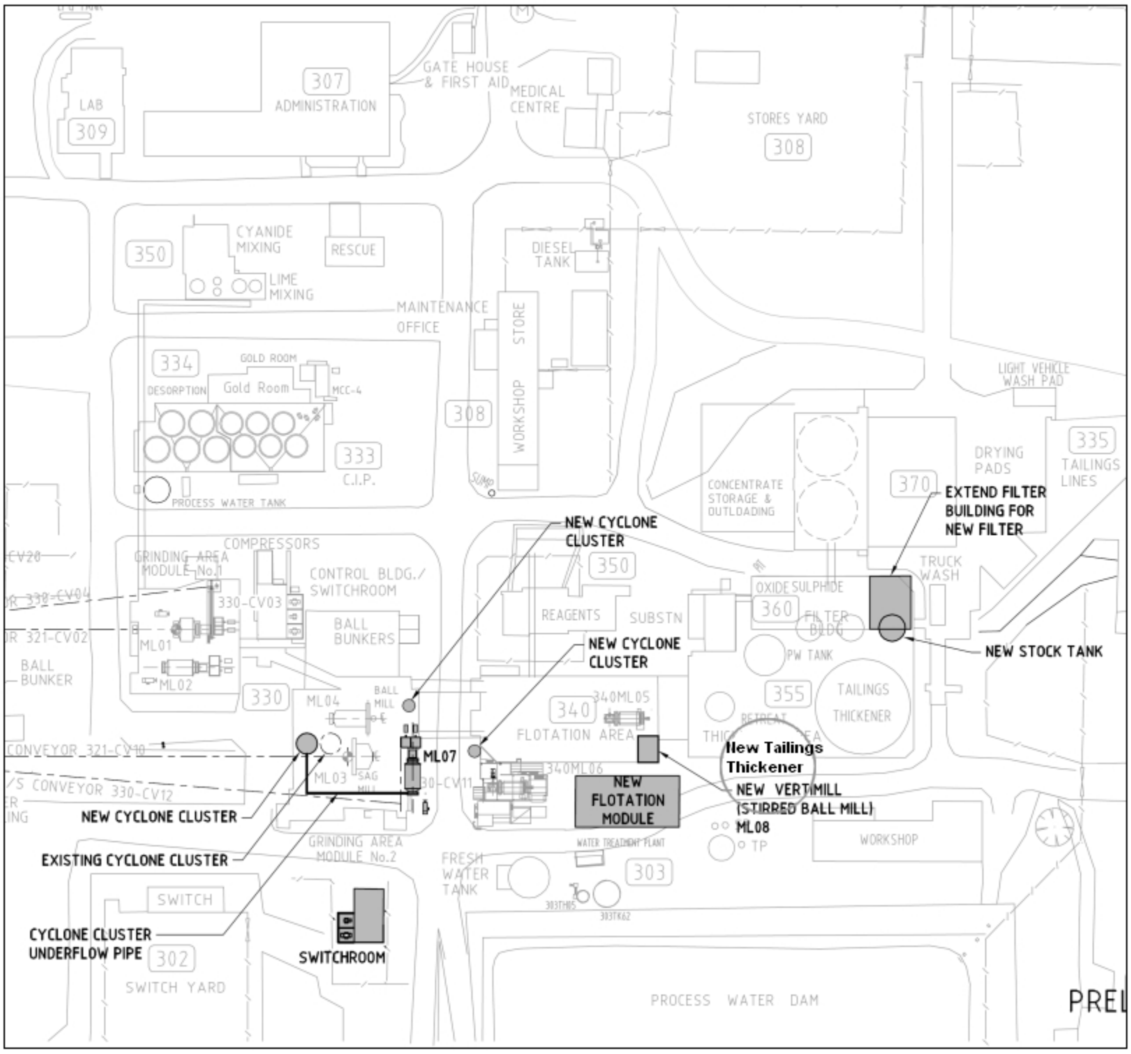


Figure 2-2 Proposed Upgrades for Ore Processing Plant

Figure 2-3 shows the location of the proposed secondary and tertiary crushers.

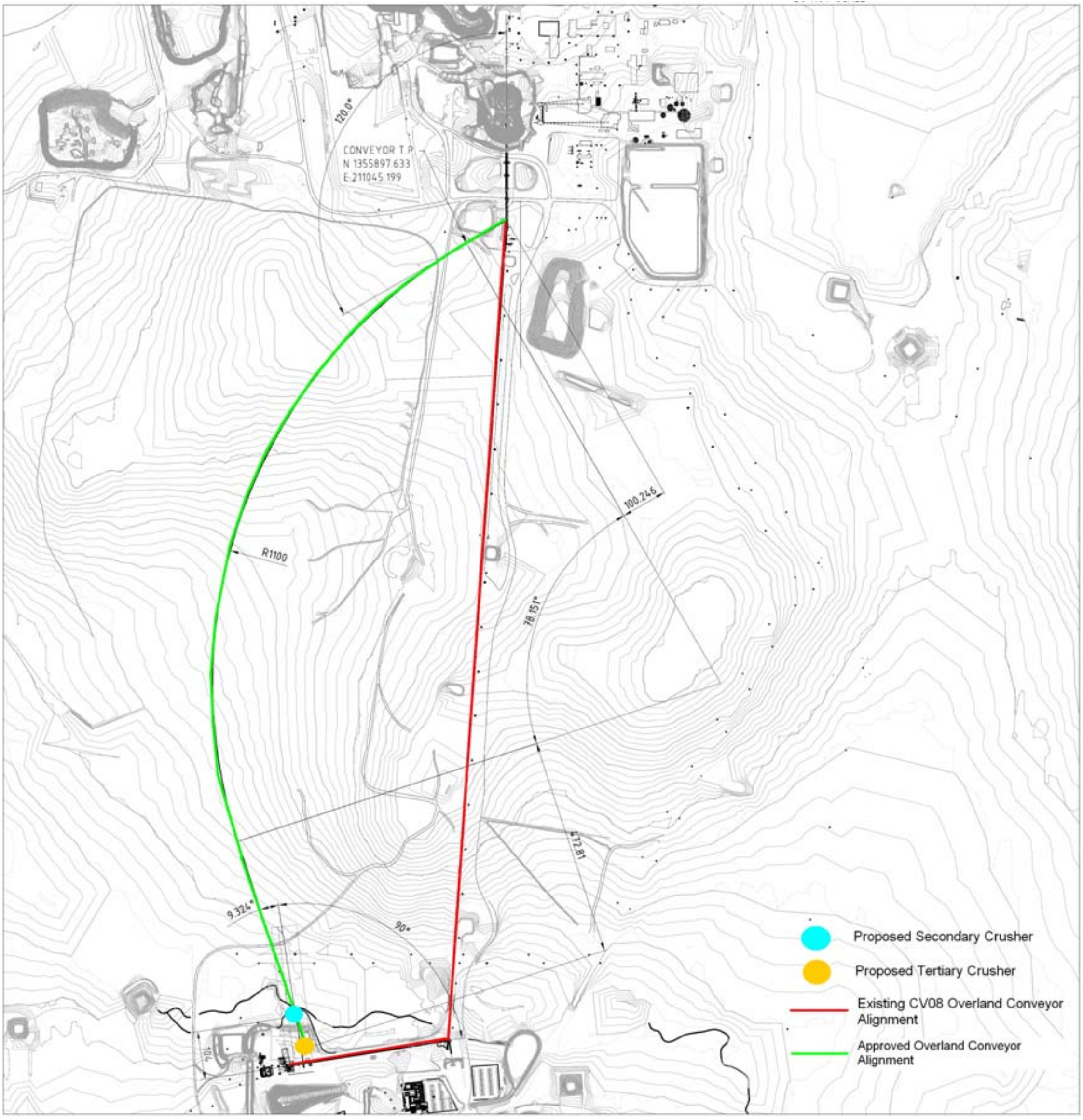


Figure 2-3 Proposed Crusher Modifications

2.4 Noise Receivers

The nearest potentially affected residential properties beyond the Project site boundary are identified in Table 2-3 and shown in Figure 2-4. GHD understand that 'Avondale' is currently unoccupied. However, as it may be occupied in future, it has been considered as part of this assessment.

Table 2-3 Identified Noise Receivers

Receiver	Land Owner	Receiver Type	Noise Modelling Coordinates	
			Easting	Northing
'Hubberstone'	A.R. Kingsmill	Rural residential	600623	6360760
'Avondale'	D.B Bicket	Rural residential	602100	6357125
'Milpose'	I.D. Hoy	Rural residential	594630	6352650
'Lone Pine'	W.H. Tanswell	Rural residential	593530	6358830

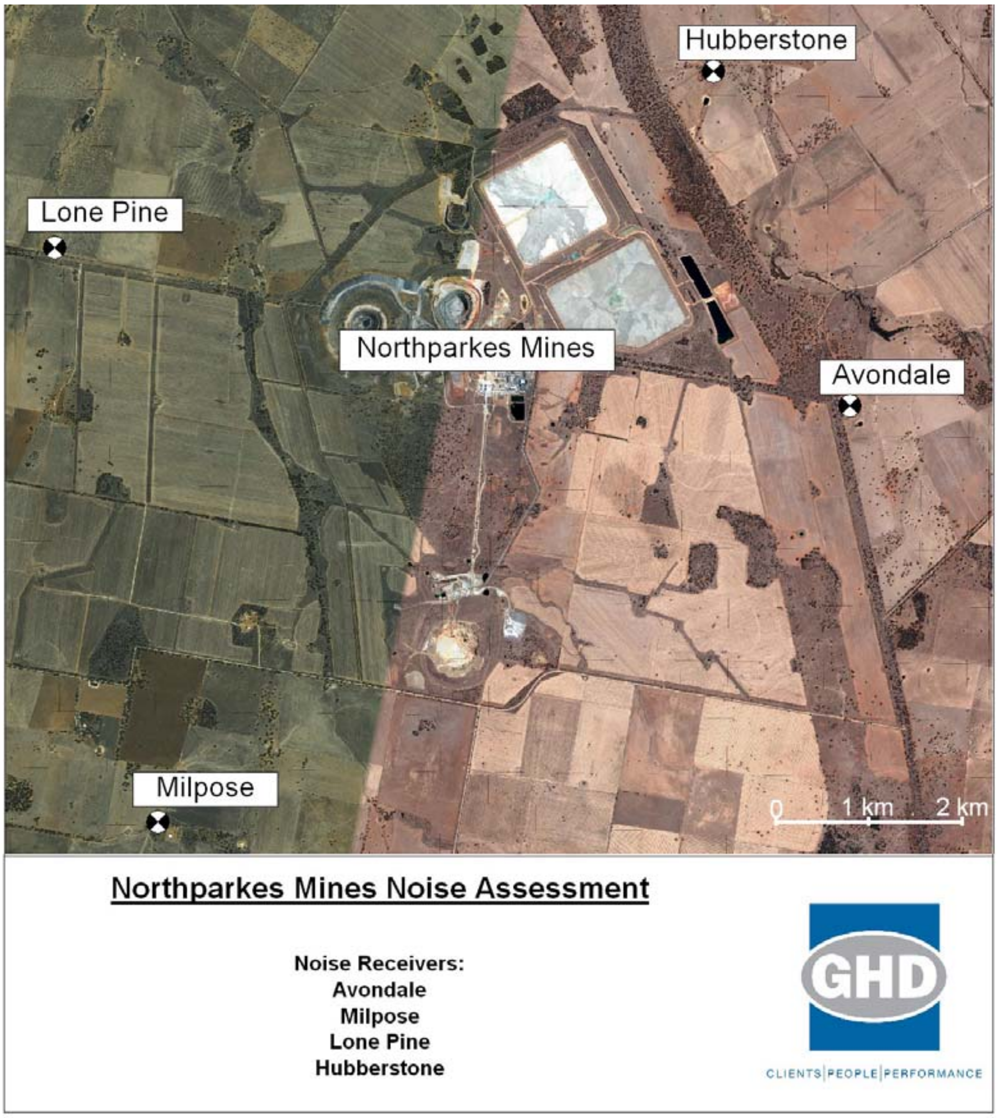


Figure 2-4 Northparkes Mines Site and Noise Receivers

2.5 Existing Noise Environment

Heggies conducted noise monitoring during typical mining operations at identified receivers around the Project site in June 2008. The results of noise monitoring were presented in Heggies report 10-5710-R3 *Northparkes Mines - Mine Operation Noise Monitoring* (June 2008). Summaries of the noise monitoring results that have been adopted for this assessment are displayed below in Table 2-4 to Table 2-7. The time breakdown for day, evening and night, as per the NSW INP are:

- Daytime: 07:00 to 18:00;
- Evening: 18:00 to 22:00; and
- Night: 22:00 to 07:00.

Table 2-4 Daytime LAeq(15minute) Mine Noise Emission Levels [1]

Monitoring Location	Mine Contributed LAeq(15minute)			Noise Emission Criteria LAeq(15minute)
	Survey 1	Survey 2	Survey 3	
'Hubberstone'	N/A[2]	N/A[2]	-[3]	35 dBA
'Lone Pine'	<25	<25	-[3]	35 dBA
'Milpose'	28-29	30	-[3]	35 dBA

Note 1: Sourced from Heggies Noise Monitoring Report, June 2008

Note 2: Mine noise emission not discernible

Note 3: "-" No survey conducted

Note 4: Incomplete survey due to rain

Note 5: Bolded values indicate exceedences

Based on daytime operator attended measurements taken by Heggies, the mine noise emissions were shown to comply at all residences.

Table 2-5 Evening Time LAeq(15minute) Mine Noise Emission Levels [1]

Monitoring Location	Mine Contributed LAeq(15minute)			Noise Emission Criteria LAeq(15minute)
	Survey 1	Survey 2	Survey 3	
'Hubberstone'	N/A[2]	N/A[2]	N/A[2]	35 dBA
'Lone Pine'	N/A[2]	<15	<15	35 dBA
'Milpose'	29	30	29	35 dBA

Note 1: Sourced from Heggies Noise Monitoring Report, June 2008

Note 2: Mine noise emission not discernible

Note 3: "-" No survey conducted

Note 4: Incomplete survey due to rain

Note 5: Bolded values indicate exceedences

Based on operator attended measurements taken by Heggies during the evening, the mine noise emissions were shown to comply at all residences.

Table 2-6 Nighttime LAeq (15minute) Mine Noise Emission Levels [1]

Monitoring Location	Mine Contributed LAeq(15minute)					Noise Emission Criteria LAeq(15minute)
	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	
'Hubberstone'	32[4]	32[4]	33[4]	32[4]	32[4]	35 dBA
'Lone Pine'	<15	<15	<15	-[3]	-[3]	35 dBA
'Milpose'	29	29	29-30	-[3]	-[3]	35 dBA

Note 1: Sourced from Heggies Noise Monitoring Report, June 2008

Note 2: Mine noise emission not discernible

Note 3: "-" No survey conducted

Note 4: Incomplete survey due to rain

Note 5: Bolded values indicate exceedences

Based on nighttime attended and unattended measurements taken by Heggies, the mine noise emissions were shown to comply at all residences.

Table 2-7 Nighttime LA1 Ambient Noise Emission Levels and Contribution of Mine Noise[1]

Monitoring Location	Measured Ambient and Mine Contributed LA1 – Measured Mine Contributed LAmax				Sleep Disturbance Criteria LA1(1minute)
	Survey 1		Survey 2		
	Ambient LA1	Mine Contributed LA1	Ambient LA1	Mine Contributed LA1	
'Hubberstone'	39	39	39	39	45 dBA
'Lone Pine'	28	<15	51	<15	45 dBA
'Milpose'	38	30	39	33	45 dBA

Note 1: Sourced from Heggies Noise Monitoring Report, June 2008

Noise monitoring indicated that the sleep disturbance criterion was met at all of the residential receivers.

Heggies also conducted a noise survey during September 2008, however this has not been included in this report since the survey included construction related noise, which is not typical mining operations.

3. Noise Model Configuration

3.1 Noise Model Set-up

Acoustic modelling was undertaken using Computer Aided Noise Abatement (Cadna-A) to predict the sound pressure levels generated by Northparkes Mines under a variety of weather conditions.

Cadna-A is a computer program for the calculation, assessment and prognosis of noise propagation. Cadna-A calculates environmental noise propagation according to ISO 9613-2, *"Acoustics – Attenuation of sound during propagation outdoors*". Ground absorption, reflection, terrain and relevant shielding objects are taken into account in the calculations.

In assessing meteorological conditions, the CONCAWE[3] method has been applied instead of ISO 9613-2 weather correction. The CONCAWE method was originally developed to predict noise levels at long distances of up to 5 km from petrochemical plants. The model was developed and its validity assessed based on extensive measurements at two oil refineries and a natural gas station.

The site has been modelled based on plant layout, building structures and noise generating equipment as provided at the time of assessment. Noise levels for existing on-site equipment were supplied to GHD by Northparkes Mines[4]. Noise levels associated with new plant and equipment has been sourced from GHD's library of technical data and previous assessments.

3.2 Modelled Scenarios

The following scenarios were modelled using CadnaA;

- Scenario 1(a): Existing and approved mine operations;
- Scenario 1(b): Construction of "Estcourt" TSF;
- Scenario 2(a): Proposed Section 75W modifications with mining capacity of 8.5 Mtpa; and
- Scenario 2(b): Proposed Section 75W modifications with mining capacity of 8.5 Mtpa and construction activity at "Estcourt" TSF.

3.3 Modelled Noise Sources and Assumptions

Appendix A details a complete list of the noise sources modelled, their locations and their sound power information.

---

[3] Concawe - the oil companies international study group for conservation of clean air and water - europe (established in 1963), report no. 4/81, „the propagation of noise from petroleum and petrochemical complexes to neighbouring communities", Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981

[4] Northparkes Mines Occupational Noise Survey (Vipac reference: 29N-06-0065-TRP-214099-0-draft -)

Additional information and assumptions that were used in the noise model are outlined below:

- All mining operations were generally modelled as operating continuously at the calculated or adopted sound power level. However, construction equipment and truck movements were not modelled as operating continuously, rather, they were modelled as operating as a percentage of the 15 minute assessment period, as detailed in Appendix A;
- Site noise sources were modelled at their location within the plant and at specific heights according to information gained through site photos as well as building layout and elevations drawings provided;
- The approved overland conveyor was modelled as a line source over its length;
- Digital 1 m topography contours of the Project site were provided for use in the noise model, including stockpiles and earth walls around the tailings storage facilities;
- A ground absorption coefficient of 0.15 has been used throughout the model that is representative of the bare soil and thin grass areas around the Project site. The tailings storage facilities were modelled with a ground absorption coefficient of 0.1;
- Noise receivers were modelled at a height of 1.5 metres above ground; and
- Atmospheric conditions were modelled as follows:
  - Neutral: 20°C and 70% relative humidity;
  - Daytime (07:00 to 18:00): 20°C and 50% relative humidity;
  - Evening (18:00 to 22:00): 10°C and 70% relative humidity; and
  - Night (22:00 to 07:00): 0°C and 90% relative humidity.

3.4 Meteorological Conditions

Heggies previously prepared an assessment of existing wind conditions for the Project Site based on site meteorological data for NPM for the period January 2004 to January 2005. The prevailing wind direction was reported to be from the South South-East (SSE) direction whereas the CoA considers wind blowing in the direction of the receivers as shown below.

As per the CoA license limits for noise, the following meteorological conditions were applied to each of the modelled scenarios:

- Wind speeds of up to 3 m/s at 10 metres above ground level in the direction of source-to-receiver. For consistency, winds in the direction of source-to-receiver have been included for all four noise receivers; or
- Temperature inversion conditions of 3^{o}C/100m (F class stability category), and wind speeds of 2 m/s at 10 metres above ground level in the direction of source-to-receiver. For consistency, winds in the direction of source-to-receiver have been included for all four noise receivers.

Therefore the model calculations given in this report represent the worst-case scenario wind direction towards all receivers, whereas in reality the dominant wind direction is from the SSE direction.

Figure 3-1 shows a 3-dimensional view of the noise model, surrounding noise receivers and noise sources with the Project Site.

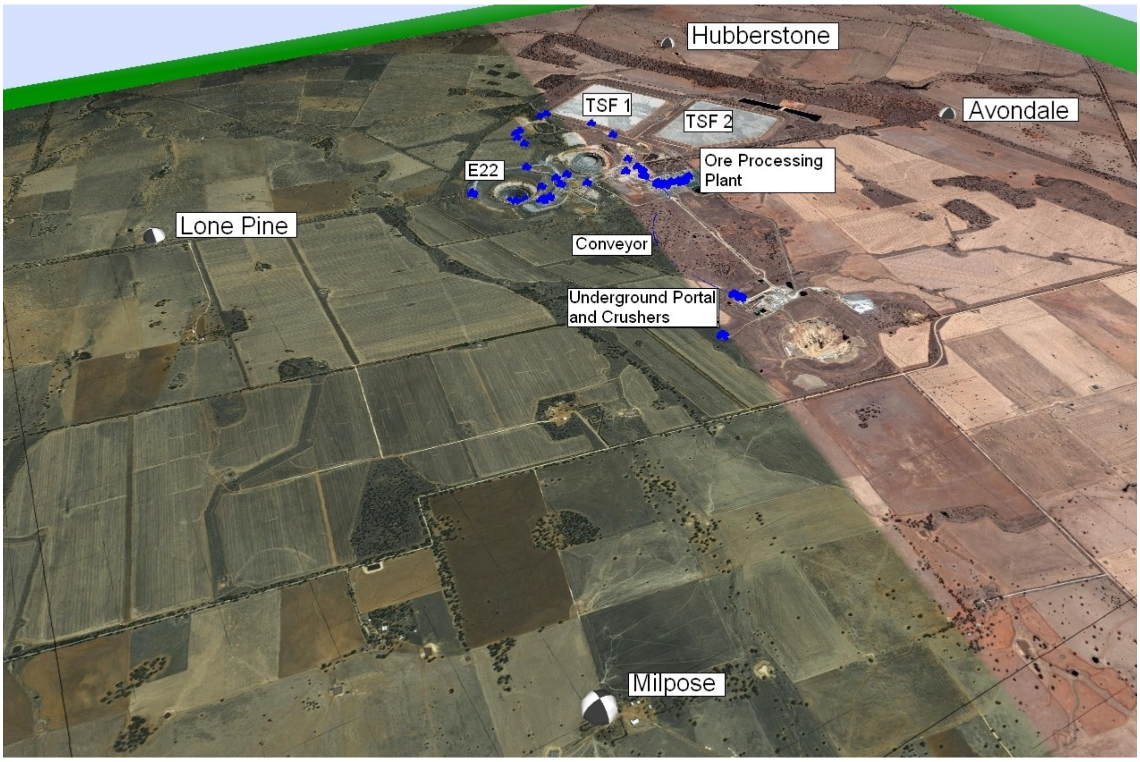


Figure 3-1 3-Dimensional Noise Model View

4. Predicted Noise Results

4.1 Existing and Approved Mine Operations – Scenario 1(a)

The existing and approved mining operations within the Project site have been modelled as a base site to which the noise levels from the Project site with the proposed modifications can be compared. Existing mining conditions included the E22 open cut pit operations, the ore processing plant, underground surface operations and the approved overland conveyor alignment.

Predicted noise levels from the operation of the existing and approved Project Site are summarised in Table 4-1. Predicted results show compliance with the license noise limit of 35 dB(A) under all operating and weather conditions at all noise receivers. Noise contours for neutral weather conditions are also provided in Appendix B.

Table 4-1 Predicted Noise Levels – Existing and Approved Operations – dB(A)

Noise Receiver	Meteorological Conditions						
	Neutral	3^{o}C Temperature Inversion and 2 m/s Wind in Direction of Receivers			3 m/s Wind in Direction of Receivers		
		Day	Evening	Night	Day	Evening	Night
'Hubberstone'	20	26	28	29	27	29	30
'Avondale'	22	28	30	31	29	31	32
'Milpose'	21	26	28	29	27	29	31
'Lone Pine'	19	25	27	28	26	28	29

4.2 "Estcourt" TSF Construction – Scenario 1(b)

4.2.1 Construction Noise Goals

As the CoA licence limits for Northparkes Mines do not specify noise criteria during construction activity, noise goals during the construction of the "Estcourt" TSF have been determined with consideration to the DECC's *New South Wales Construction Noise Guidelines: Draft for consultation* (August 2008). The DECC guideline recommends a qualitative assessment be undertaken for large infrastructure activities.

This guideline recommends standard hours for construction activity as follows:

- Monday to Friday: 7 am to 6 pm;
- Saturday: 8 am to 1 pm; and
- No work on Sundays or Public Holidays.

GHD understand that TSF construction will occur 24 hours per day, seven days per week.

The DECC construction noise criteria are to be calculated based on the adopted rating background level (RBL) at nearby residential locations. In absence of long-term unattended background noise monitoring data, without noise contribution of the existing Northparkes Mines, the DECC's INP minimum recommended rating background level (RBL) of 30 dB(A) has been adopted. Table 4-2 details the adopted construction noise goals for the proposed works.

Table 4-2 NSW DECC Construction Noise Goals

Time period	Management Level $L_{Aeq\ (15\ min)}$ dB(A)	Adopted RBL $L_{A90\ (period)}$ dB(A)	Adopted Noise Goal $L_{Aeq\ (15\ min)}$ dB(A)
Recommended standard hours: Monday to Friday: 7 am to 6 pm Saturday: 8 am to 1 pm No work on Sundays or Public Holidays	Noise affected RBL + 10 dB(A)	30 [1]	40
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	30 [1]	35

(1) The DECC's NSW INP, requires a minimum rating background level of 30 dB(A).

Based on the proposed construction times, this assessment will be based on the most sensitive nighttime construction noise goal of 35 dB(A) $L_{Aeq\ (15\ minute)}$.

4.2.2 Predicted Results

Predicted noise levels from the construction of the "Estcourt" TSF are summarised in Table 4-3. Modelled results are predicted to comply with the DECC nighttime noise goal of 35 dB(A) under the assessed weather conditions at 'Hubberstone', 'Avondale' and 'Milpose'. However, a 1 dB(A) exceedence is predicted at 'Lone Pine' under noise-enhancing weather conditions.

Table 4-3 Predicted Noise Levels – "Estcourt" TSF Construction – dB(A)

Noise Receiver	Meteorological Conditions						
	Neutral	3°C Temperature Inversion and 2 m/s Wind in Direction of Receivers			3 m/s Wind in Direction of Receivers		
		Day	Evening	Night	Day	Evening	Night
'Hubberstone'	22	27	29	29	28	30	30
'Avondale'	16	21	22	24	22	24	25
'Milpose'	10	14	16	18	17	19	20
'Lone Pine'	26	32	34	35	33	35	**36**

Note: Bold text indicates noise levels of non-compliance

4.3 Predicted 75W Modification Noise Levels – Scenario 2(a)

Predicted noise levels from the operation of the proposed modifications to the existing Project Site are summarised in Table 4-4. Modelled results are predicted to comply with the license noise limit of 35 dB(A) under all operating and weather conditions at all noise receivers. Noise contours are also provided in Appendix B.

Table 4-4 Predicted Noise Levels – Modification Operations – dB(A)

Noise Receiver	Meteorological Conditions						
	Neutral	3°C Temperature Inversion and 2 m/s Wind in Direction of Receivers			3 m/s Wind in Direction of Receivers		
		Day	Evening	Night	Day	Evening	Night
'Hubberstone'	21	26	29	30	28	30	31
'Avondale'	23	29	31	32	30	32	33
'Milpose'	23	28	30	31	29	31	33
'Lone Pine'	23	28	30	31	30	32	33

4.4 Cumulative Noise Levels – Scenario 2(b)

As mining operations and construction of the "Estcourt" TSF will occur simultaneously within the Project Site, the cumulative noise levels of these activities have also been assessed against the license noise limits.

Predicted noise levels from the operation of the proposed modifications to the existing Project Site are summarised in Table 4-5. Predicted results show compliance with the license noise limit of 35 dB(A) under all operating and weather conditions at 'Hubberstone', 'Avondale' and 'Milpose'. However, the license limit of 35 dB(A) is predicted to be exceeded under noise enhancing conditions at 'Lone Pine', by up to 3 dB(A).

Table 4-5 Predicted Noise Levels – Cumulative Operation and Construction – dB(A)

Noise Receiver	Meteorological Conditions						
	Neutral	3°C Temperature Inversion and 2 m/s Wind in Direction of Receivers			3 m/s Wind in Direction of Receivers		
		Day	Evening	Night	Day	Evening	Night
'Hubberstone'	24	30	32	33	31	32	34
'Avondale'	24	29	31	33	31	33	34
'Milpose'	23	28	30	31	30	31	33
'Lone Pine'	28	33	35	**36**	35	**36**	**38**

Note: Bold text indicates noise levels of non-compliance

4.5 Traffic Noise

Currently there are 38 truck movements from Northparkes Mines. The increase in ore production is predicted to increase concentrate truck movements by approximately 10 movements per week or 1-2 movements per day.

Based on the volume change, the additional truck movements equates to approximately 1 dB increase in noise level, therefore this change is expected not to be noticeable to nearby receivers.

4.6 Sleep Disturbance

Typically the L_{max} noise descriptor is substituted for the $L_{1(1\ minute)}$ descriptor when assessing sleep disturbance impact which provides a slightly more conservative approach.

The operational noise impact has been assessed using Sound Power Levels for equipment based on L_{Aeq} noise levels. Typically, the L_{max} and L_{Aeq} descriptors for mining equipment, which is dominated by steady state sources such as engine noise or processing plant noise, differ by less than 5 dB. Exceptions to this rule include noise sources such as dozer track slap, which inherently has higher maximum noise levels.

To allow for the additional noise due to dozer track slap, the noise model includes sound power levels for D11R track dozers in dynamic forward operation. Furthermore, equipment information provided by Northparkes Mines indicates that smaller D10 track dozers are used on the site, therefore the noise model provides a measure of conservatism in this respect.

As such, the predicted L_{max} received noise levels are expected to be under the 45 dB(A)L_1 sleep disturbance criteria.

4.7 Discussion of Results

Predicted noise levels from the Project Site operations following the proposed modifications show that the license limit of 35 dB(A) should be met at all noise receivers and under all weather conditions.

A comparison of predicted noise results following the modifications to the existing and approved operations show increases in noise levels of up to 4 dB(A) at noise receivers. These increases are primarily experienced at receivers ‘Milpose’ and ‘Lone Pine’ and can be attributed to the addition of the secondary and tertiary crushers near the underground mine portal.

Noise levels during the construction of the “Estcourt” TSF show a possible 1 dB(A) exceedence of the nighttime noise goal at ‘Lone Pine’, while noise levels at all other receivers are shown to comply under all weather conditions. As a result of a possible exceedence, recommendations for noise mitigation measures have been outlined in Section 6 of this report.

5. Blasting Vibration Assessment

The DECC's *Assessing Vibration: a technical guideline* requires that vibration and overpressure from blasting be assessed against the levels in the Australian and New Zealand Environment Council (ANZEC) *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*, 1990. The ANZEC guideline recommends criteria for ground vibration and airblast overpressure consistent with the Northparkes Mines license limits. Approved hours for surface blasting are between 9:00 to 17:00, Monday to Saturday and at no time on Sundays.

GHD understand that approved underground blasting at the Project site occurs 24 hours per day.

5.1 Underground Blasts

Blast emission prediction formulae for the calculation of ground vibration and airblast overpressure from underground blasting have been adopted from the Heggies Report as below:

Peak Vector Sum (PVS) Vibration Velocity (mm/s)

$PVS\ (5\%) = 223.7x\ (SD_1)^{-1.14}$ Equation (1)

Peak Airblast Linear Sound Pressure Level (dB re 20μPa)

$SPL\ (5\%) = 159.6 – 17.3 \log (SD_2)$ Equation (2)

Where SD_1 and SD_2 are the ground vibration and airblast scaled distances, where:

$$SD_1 = \frac{Distance}{\sqrt{MIC}} \left(m.kg^{-\frac{1}{2}} \right) \qquad SD_2 = \frac{Distance}{\sqrt[3]{MIC}} \left(m.kg^{-\frac{1}{3}} \right)$$

The above formulas have been used to predict the levels of ground vibration and airblast at the identified receivers and are presented in Table 5-1.

Table 5-1 Predicted Underground Blast Emissions (50kg to 1000kg) – Source: Heggies

Receiver	Nearest Distance (m)		Predicted Blast Emission Levels			
	Blast Site	Portal	PVS (mm/s)		Peak Airblast dB(L)	
			50 kg	1000 kg	50 kg	1000 kg
'Hubberstone'	5172 m	6335 m	0.1	0.7	94	101
'Avondale'	3946 m	4861 m	0.2	0.9	96	103
'Milpose'	5118 m	3992 m	0.1	0.7	97	105
'Lone Pine'	5490 m	5543 m	0.1	0.6	97	102

Note: Peak Linear airblast includes a 10 dB underground propagation loss for underground blasts.

Assuming a charge mass of 1000 kg, the predicted blast emission levels for underground blasting suggest that the criteria set in Table 2 of the license limits will be met at identified receivers.

5.2 Open Cut Blasts

The Heggies report reviewed previous blast emission monitoring data (vibration and airblast) taken of blasts within E22 for the period between 30 January 2004 and 31 December 2004. This data revealed that vibration levels ranged from 0.2 mm/s to 0.44 mm/s and airblast levels ranged from 104.7 dB(L) to 113.9 dB(L).

These measurements suggest that the ongoing operations within the E22 open cut mine should not cause adverse impacts resulting from blasting.

6. Recommendations

Due to the predicted noise goal exceedences during construction activity, some in-principle mitigation measures have been provided below to assist with noise control during the construction phase of the proposed “Estcourt” TSF.

The purpose of the below recommendations is to ensure that all feasible and reasonable measures enabling control and minimisation of site noise emissions are considered.

6.1 Work Ethics / Community Relations

- All site personnel should be sensitised to the potential for noise impacts onto local residents and encouraged to take all practical and reasonable measures to minimise noise during the course of their activities; and
- An NPM representative (as appropriate) should establish contact with the local residents and communicate the construction program and progress on a regular basis.

6.2 General Recommendations

As far as practicable, the following general noise control measures should be incorporated in the construction environmental management plan (CEMP):

- Review available fixed and mobile equipment fleet and fit with low pitch reversing beepers and sound attenuation mufflers, wherever possible. In any case, all equipment used on site should be in good condition and good working order;
- Plan to use equipment appropriate for the required tasks in terms of power requirements;
- Engine covers should be kept closed while equipment is operating;
- As far as possible, materials dropping from heights into or out of trucks should be minimised;
- Vehicles should be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable;
- Where practical, machines should be switched off when not being used rather than left idling for prolonged periods; and
- Machines found to produce abnormally high noise should be removed from the site or stood down until repairs or modifications can be made.

7. Conclusions

GHD has undertaken a Noise Impact Assessment for the proposed Section 75W modification to the Northparkes Mines (NPM) operations, near Parkes NSW.

The proposed Section 75W modification included the following:

- Construction of a new tailings storage facility ("Estcourt" TSF) including any associated floor preparation and drainage system;
- Increase the limit on approval from 6.5 million tonnes of ore per year to 8.5 million tonnes of ore per year processed;
- Extend the life of the mine through 2025 through more efficient mining of the E48 resource;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations;
- Upgrades and modifications to existing processing infrastructure including:
  - Module 1 and 2 Grinding Circuits;
  - Module 1 and 2 Flotation Circuits;
  - Module 3 Flotation Circuit;
  - Concentrate Handling Facilities; and
  - Tailings Handling Facilities.

This assessment has been conducted with consideration to the following NSW Department of Environment and Climate Change (DECC) Noise Policies:

- Industrial Noise Policy (INP);
- Environmental Noise Control Manual (ENCM), Chapter 19; and
- New South Wales Construction Noise Guidelines: Draft for consultation (August 2008).

Section 1.4 of this report outlines the noise limits as specified in the Northparkes Mines Specific Environmental Conditions of the Condition of Approval (CoA) and the Statement of Commitments of the CoA.

Predicted noise levels from the Project Site operations following the proposed modifications show that the license limit of 35 dB(A) is expected to be met at all noise receivers under the modelled weather conditions.

A comparison of predicted noise results following the modifications to the existing and approved mining operations show increases in noise levels of up to 4 dB(A) at the nearest receivers, however remaining compliant with the 35 dB(A) noise goal. These increases are primarily experienced at receivers ‘Milpose’ and ‘Lone Pine’ and can be mainly attributed to the addition of the secondary and tertiary crushers near the underground mine portal area.

Noise levels during the construction of the "Estcourt" Tailings Storage Facility (TSF) show a potential 1 dB(A) exceedence of the nighttime noise goal at 'Lone Pine' receiver, while noise levels at all other receivers are shown to comply under all modelled weather conditions. As a result of the potential exceedence, general recommendations for noise mitigation measures have been outlined in Section 6 of this report.

Predicted cumulative noise impacts from the proposed operations and construction of "Estcourt" TSF suggest compliance with the license noise limit of 35 dB(A) under all weather conditions at 'Hubberstone', 'Avondale' and 'Milpose'. However, model results suggest a potential exceedence of up to 3 dB(A) above the nighttime noise goal at 'Lone Pine' receiver.

Based on the predicted increase in truck movements associated with the proposed increase in ore production, traffic noise impact is expected not to be noticeable on the local road network to receivers.

Impulsive noise from dozer tracks has been assessed with consideration to the sleep disturbance criteria by incorporating dynamic D11R track dozer operation into the noise model. Maximum received noise levels due to track dozer operation are expected to be under the 45 dB(A)L_1 sleep disturbance criteria at all identified receivers.

Predicted ground vibration and airblast levels are expected to be under the blast and vibration license limits at identified receivers.

Based on the information provided, assumptions made and the results of the assessment, it is considered that project specific noise goals may be achieved at the nearest potentially affected receivers based on the proposed mining operations. However, there is potential exceedance of the noise goals during construction of "Estcourt" TSF under adverse weather conditions. General mitigation measures have been recommended in Section 6 to minimise construction noise during these conditions.

Appendix A

Sound Power Levels

Noise Sources Modelled

Table A-1 Sound Power Levels and Characteristics

Scenario Modelled	Name	Area/Use	Lw dB(A)	Operating Time per 15 mins	Height (m)	Coordinates	
						X (m)	Y (m)
Existing OPP Equipment	Rill Tower 1	Mill	91.9	15	20	598167	6357363
Existing OPP Equipment	Rill Tower 2	Mill	91.9	15	20	598166	6357323
Existing OPP Equipment	CR02 Crusher	Mill	89.5	15	10	598244	6357364
Existing OPP Equipment	CR03 Crusher	Mill	91.3	15	10	598244	6357324
Existing OPP Equipment	Module1	Mill	117.5	15	4	598336	6357368
Existing OPP Equipment	Module 2	Mill	117.3	15	4	598392	6357329
Existing OPP Equipment	ML06	Mill	102.4	15	5	598445	6357317
Existing OPP Equipment	ML05	Mill	102.8	15	4	598486	6357341
Existing OPP Equipment	Shaft Vent Fan	Mill	90.7	15	3	597204	6354990
Existing OPP Equipment	Primary Jaw Crusher	Mill	113.7	1	3	598177	6357606
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	1	4	598176	6357644
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	1	4	598051	6357776
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	1	4	597342	6357996
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	3	4	597024	6357658
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	1	4	596790	6357815
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	3	4	596453	6358101

Scenario Modelled	Name	Area/Use	Lw dB(A)	Operating Time per 15 mins	Height (m)	Coordinates	
						X (m)	Y (m)
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	3	4	597092	6357672
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	1	4	596958	6357933
Existing E22 Equipment	777 Dump Truck	E22 Pit/ROM	112.2	1	4	596822	6358034
Existing E22 Equipment	Drill Rig	E22 Pit	113.1	15	2	596866	6357956
Existing E22 Equipment	Grader	Roaming Pit	108.6	1	2	597319	6357855
Existing E22 Equipment	Dozer on Waste 2 dump	Waste dump cleanup	117	7.5	3.5	596993	6357661
Existing E22 Equipment	Dozer at ROM	ROM cleanup	117	1	3.5	598213	6357704
Existing E22 Equipment	Excavator on pit floor	Pit Floor	115.4	15	4	596859	6358005
Existing E22 Equipment	Front End Loader Mill Cleanup	Mill Cleanup	104.6	1	2	598215	6357422
Existing E22 Equipment	Fuel truck	Roaming Pit	100.6	15	2	597586	6357780
Existing E22 Equipment	Water Cart	Roaming Pit	116.5	1	2	598209	6357801
Existing E22 Equipment	Water Cart	Roaming Pit	116.5	1	2	597148	6357941
TSF “Estcourt” construction	Water Cart	TSF Construction	116.5	1	2	597453	6358912

Scenario Modelled	Name	Area/Use	Lw dB(A)	Operating Time per 15 mins	Height (m)	Coordinates	
						X (m)	Y (m)
TSF “Estcourt” construction	Haul Truck	TSF Construction	109.4	1	3	598421	6358630
TSF “Estcourt” construction	Haul Truck	TSF Construction	109.4	1	3	598359	6358994
TSF “Estcourt” construction	Haul Truck	TSF Construction	109.4	1	3	598244	6358037
TSF “Estcourt” construction	Haul Truck	TSF Construction	109.4	1	3	597493	6358038
TSF “Estcourt” construction	Haul Truck	TSF Construction	109.4	1	3	597490	6359202
TSF “Estcourt” construction	Haul Truck	TSF Construction	109.4	1	3	597950	6359474
TSF “Estcourt” construction	Excavator	TSF Construction	109.8	15	3	598035	6359480
TSF “Estcourt” construction	Dozer	TSF Construction	114	15	2.5	597454	6359083
TSF “Estcourt” construction	Roller	TSF Construction	101.6	15	2.5	597563	6359240
Existing E22 Equipment	Grader	Roaming Pit	108.6	1	2	597195	6358369
Existing E22 Equipment	Dozer	Waste dump cleanup	117	7.5	3	596463	6358134
New OPP equipment	CycML03	New Cyclone Cluster in Mill	95.6	15	4	598384	6357329
New OPP equipment	CycML04	New Cyclone Cluster in Mill	93.1	15	4	598412	6357347
New OPP equipment	CycML06	New Cyclone Cluster in Mill	93.4	15	4	598433	6357327
New OPP equipment	Flotation Module	New Flotation Module in Mill	95.2	15	4	598476	6357323

Scenario Modelled	Name	Area/Use	Lw dB(A)	Operating Time per 15 mins	Height (m)	Coordinates	
						X (m)	Y (m)
New OPP equipment	ML08	New Vertimill (Stirred ball Mill)	105.3	15	4	598491	6357333
New OPP equipment	Filter	New Filter	87.2	15	4	598567	6357379
New OPP equipment	Secondary Crusher	New Secondary Crusher	111.7	15	2	597644	6355411
New OPP equipment	Tertiary Crusher	New Tertiary Crusher	111.7	15	2	597663	6355348
New OPP equipment	Tailings Thickener	New Tailings Thickener	98	15	1	598539	6357323
Existing OPP Equipment	CV10	Mill Conveyor	98	15			
Existing OPP Equipment	CV12	Mill Conveyor	100.4	15			
Existing OPP Equipment	CV02	Mill Conveyor	97.4	15			
Existing OPP Equipment	CV04	Mill Conveyor	99.8	15			
Existing OPP Equipment	CV13	Mill Conveyor	99.5	15			
Existing OPP Equipment	CV08	Overland Conveyor Re-alignment	110.2	15			
Existing OPP Equipment	CV09	Mill Conveyor	91.7	15			
Existing OPP Equipment	CV01	Mill Conveyor	99.4	15			

Appendix B

Noise Contour Maps

Modelled Results

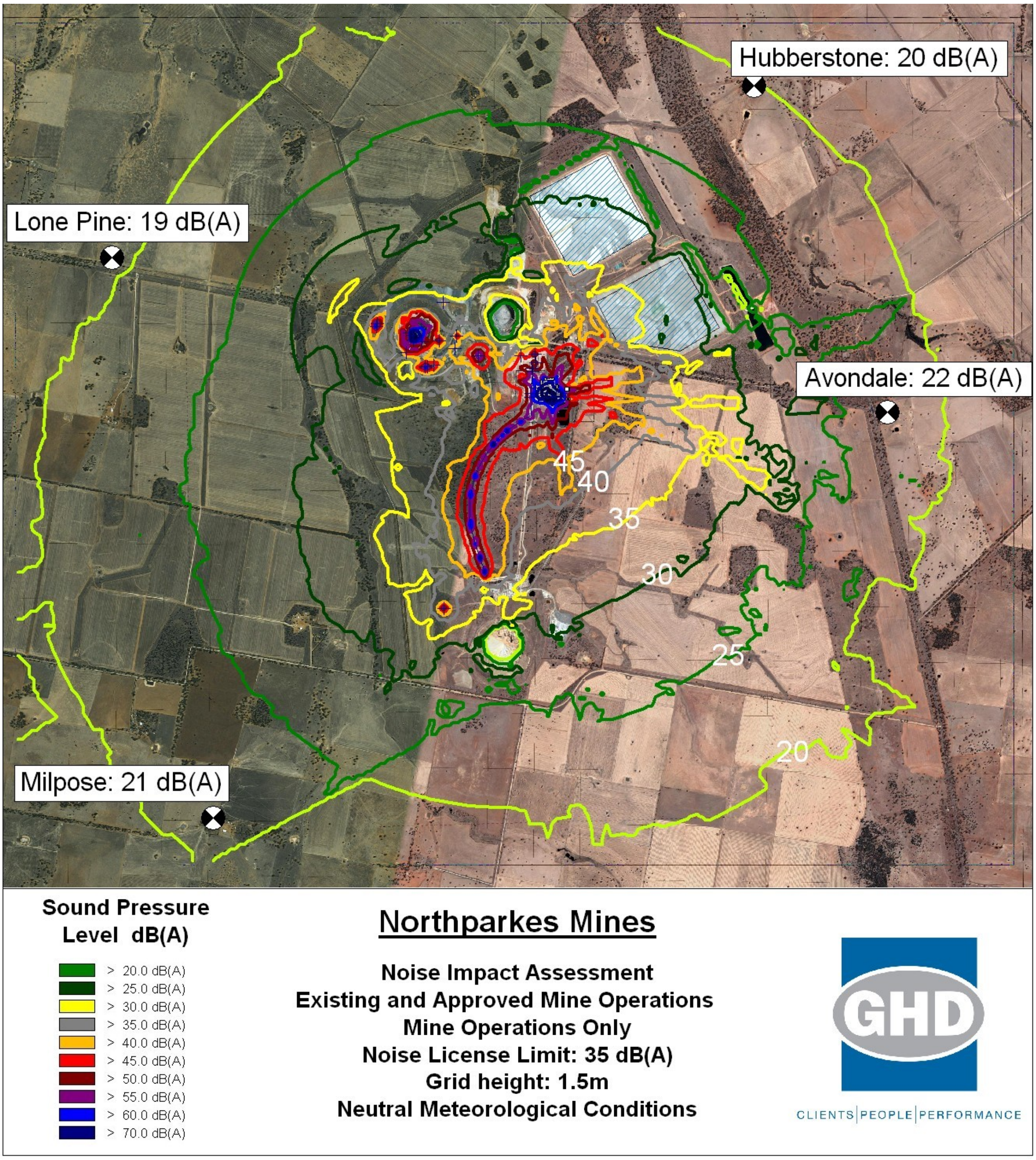


Figure B-1 Scenario 1a – Existing and Approved Mining Operations Under Neutral Weather Conditions

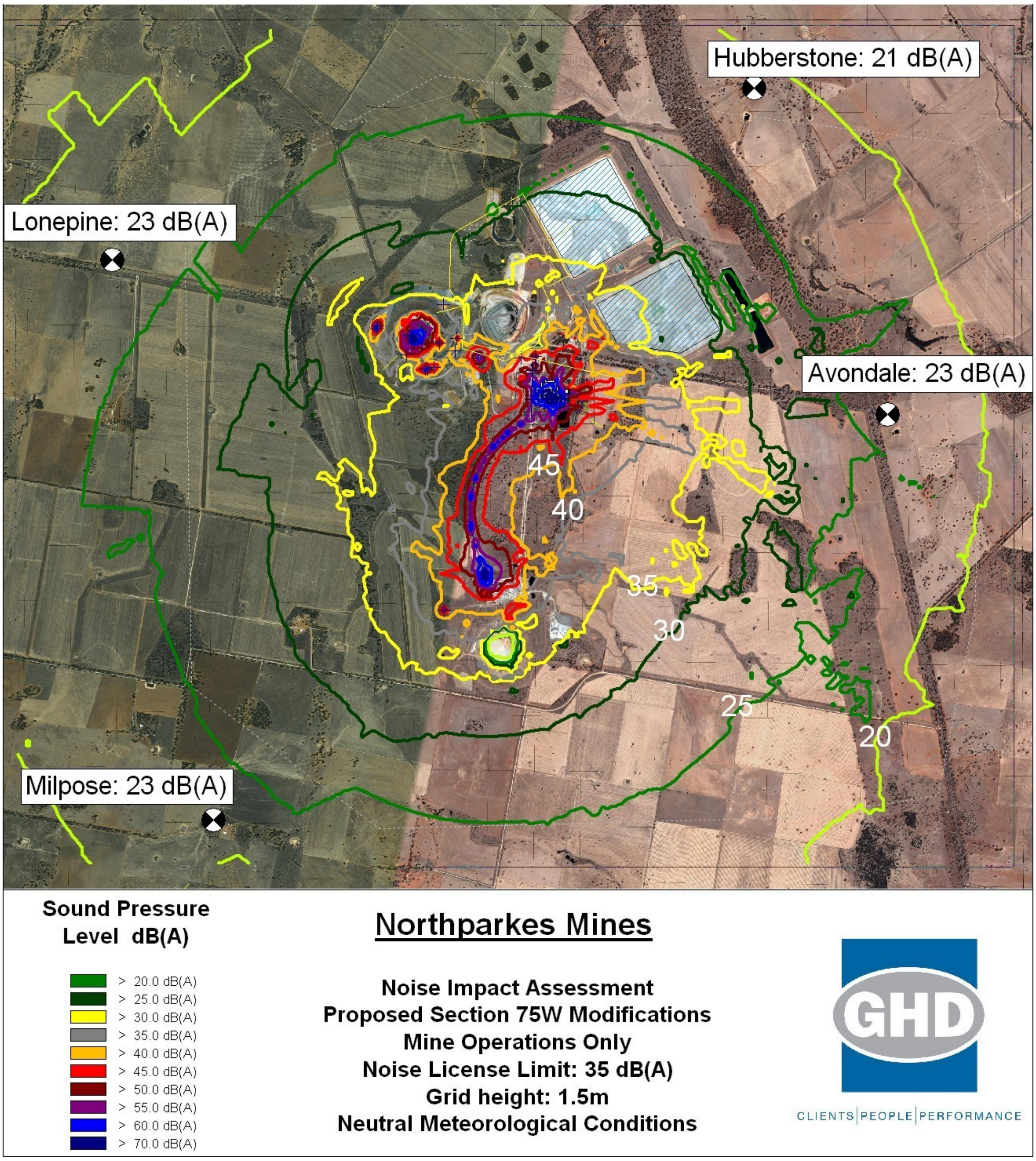


Figure B-2 Scenario 2a – Proposed Section 75W Modifications Under Neutral Weather Conditions

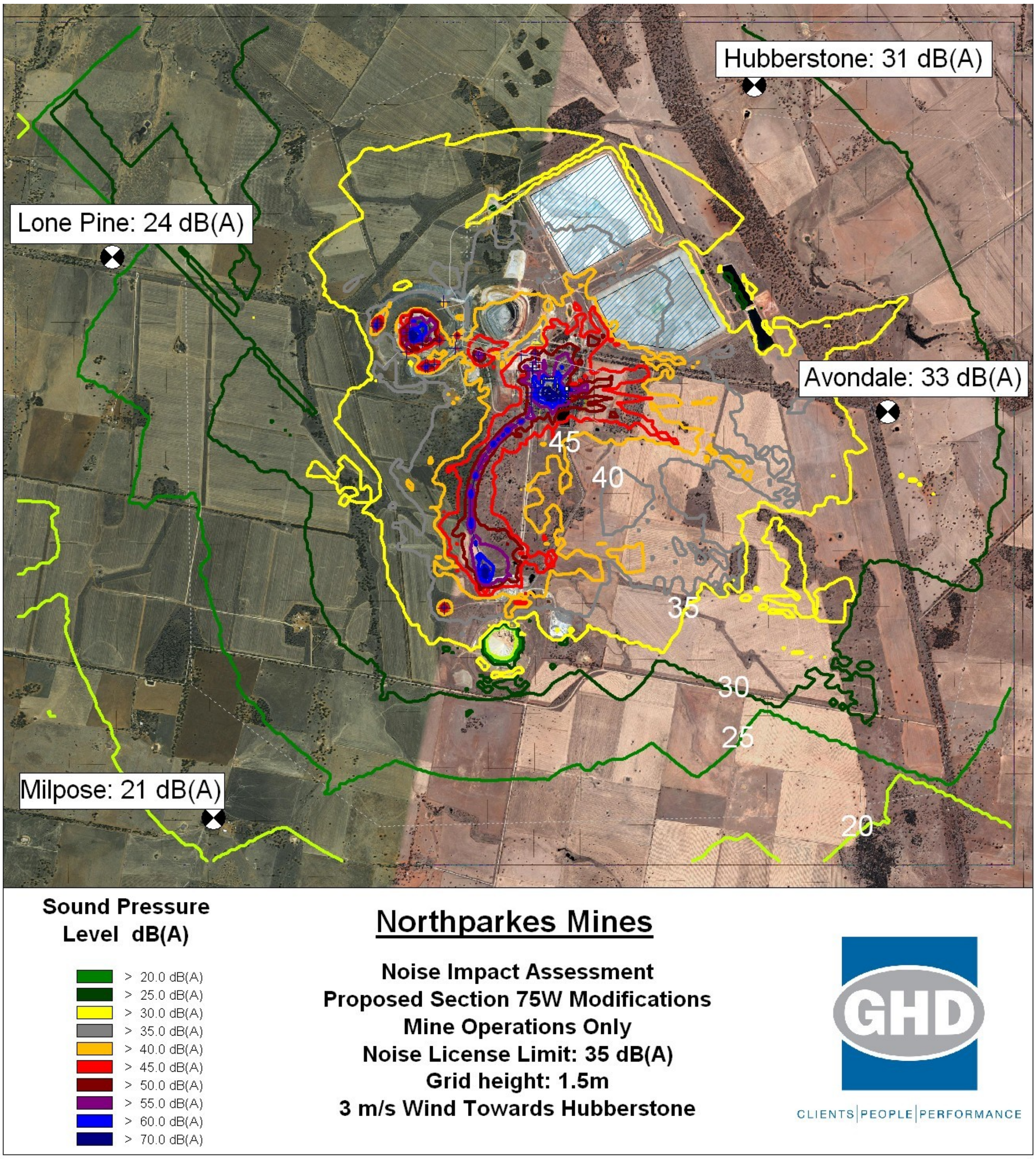


Figure B-3 Scenario 2a – Proposed Section 75W Modifications (Wind Towards 'Hubberstone')

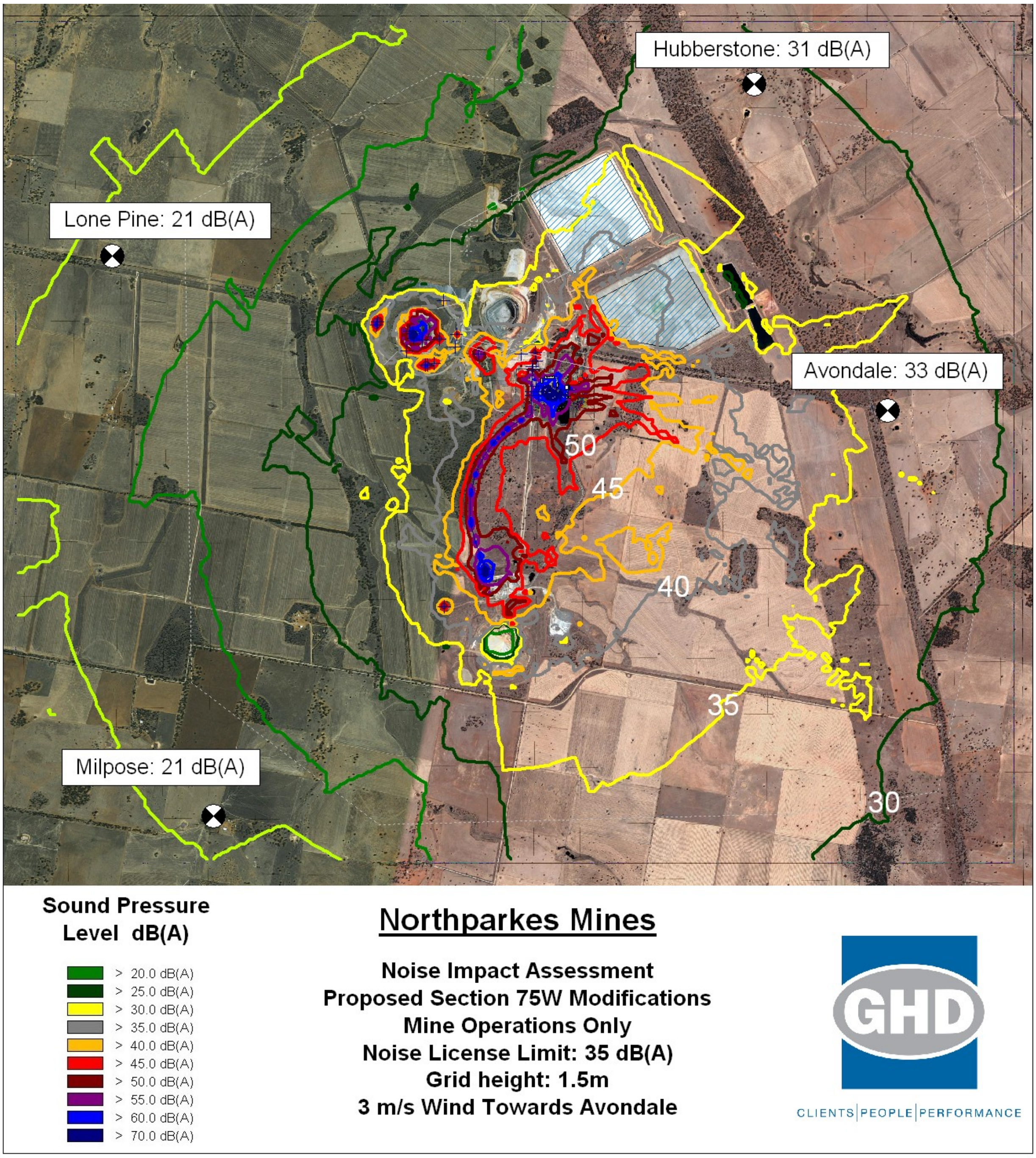


Figure B-4 Scenario 2a – Proposed Section 75W Modifications (Wind Towards 'Avondale')

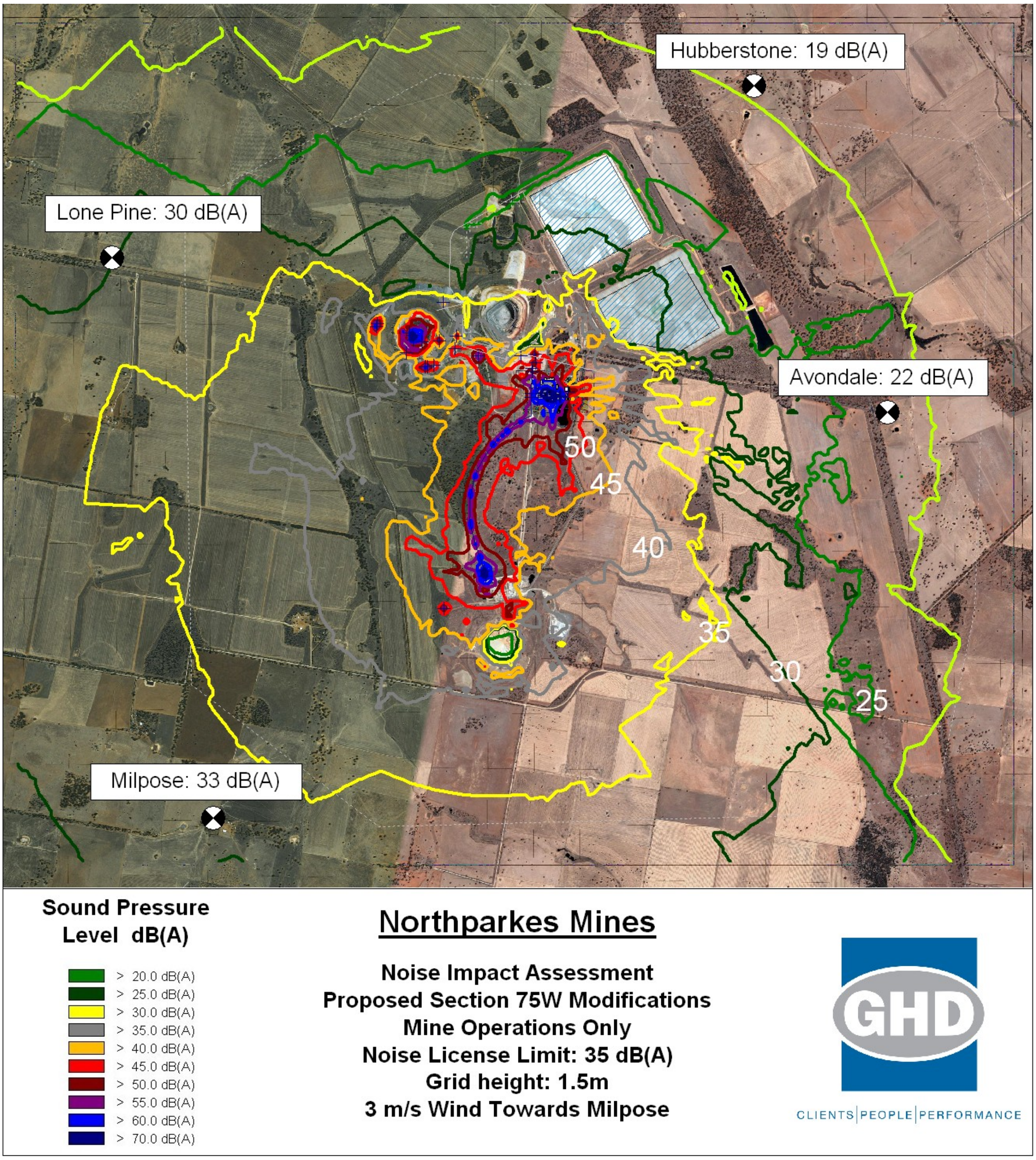


Figure B-5 Scenario 2a – Proposed Section 75W Modifications (Wind Towards 'Milpose')

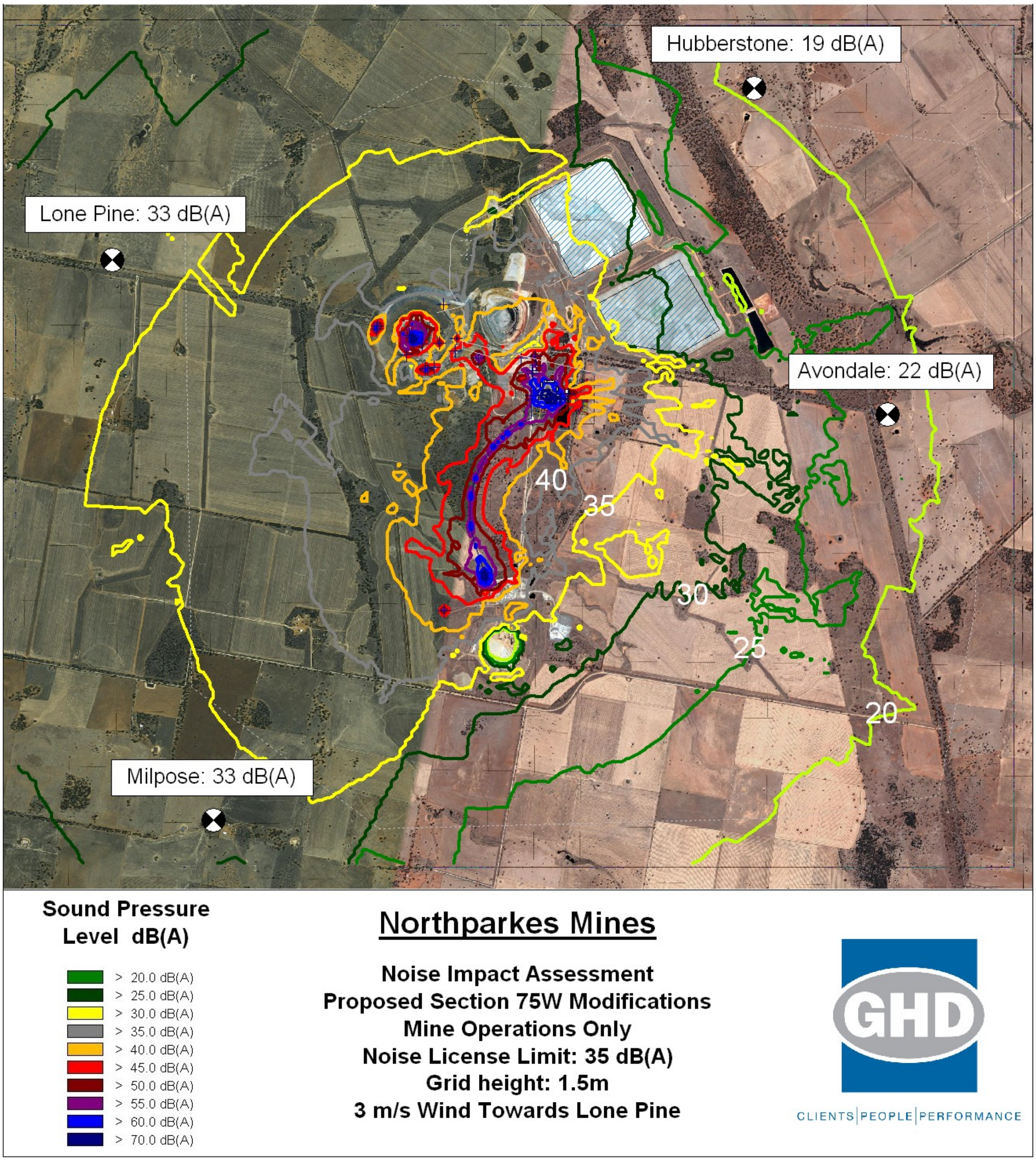


Figure B-6 Scenario 2a – Proposed Section 75W Modifications (Wind Towards 'Lone Pine')

GHD

352 King St Newcastle NSW 2300
PO Box 5403 Hunter Region Mail Centre NSW 2310
T: (02) 4979 9999 F: (02) 4979 9988 E: ntlmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft	T Gribble / C Evenden	V Chavand	*V Chavand*	G Collins	*G Collins*	19/12/08
0	T Gribble / C Evenden	V Chavand	*V Chavand*	G Collins	*G Collins*	19/12/08
1	T Gribble / C Evenden	V Chavand	VChavand	S Pearce	SPearce	13/01/09

Appendix C

Air Quality Assessment

CLIENTS | PEOPLE | PERFORMANCE

North Mining Limited

Section 75W Modification for Northparkes Mine

Air Quality Assessment

December 2008

Revision 0

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Figure Index

1. Introduction

The Project Approval (No. 06-0026) gave North Mining Limited approval under Part 3A of the Environmental Planning & Assessment Act 1979 to extend its underground gold/copper mine at Northparkes Mine (NPM). The approved project included:

- Continued use of existing infrastructure at the mine to a maximum capacity of 6.5 million tonnes of ore per year;
- Establishment of a new underground mine (E48) to extract up to 34 million tonnes of ore to 2018; and
- Construction and use of additional infrastructure, including an above-ground conveyor and two tailings dams.

North Mining Limited now seek to increase the operational capacity of the mine and improve tailings management by introducing an expanded process and a new tailings storage facility. The relevant proposed modifications are hereafter referred to as the 'proposed works' and include:

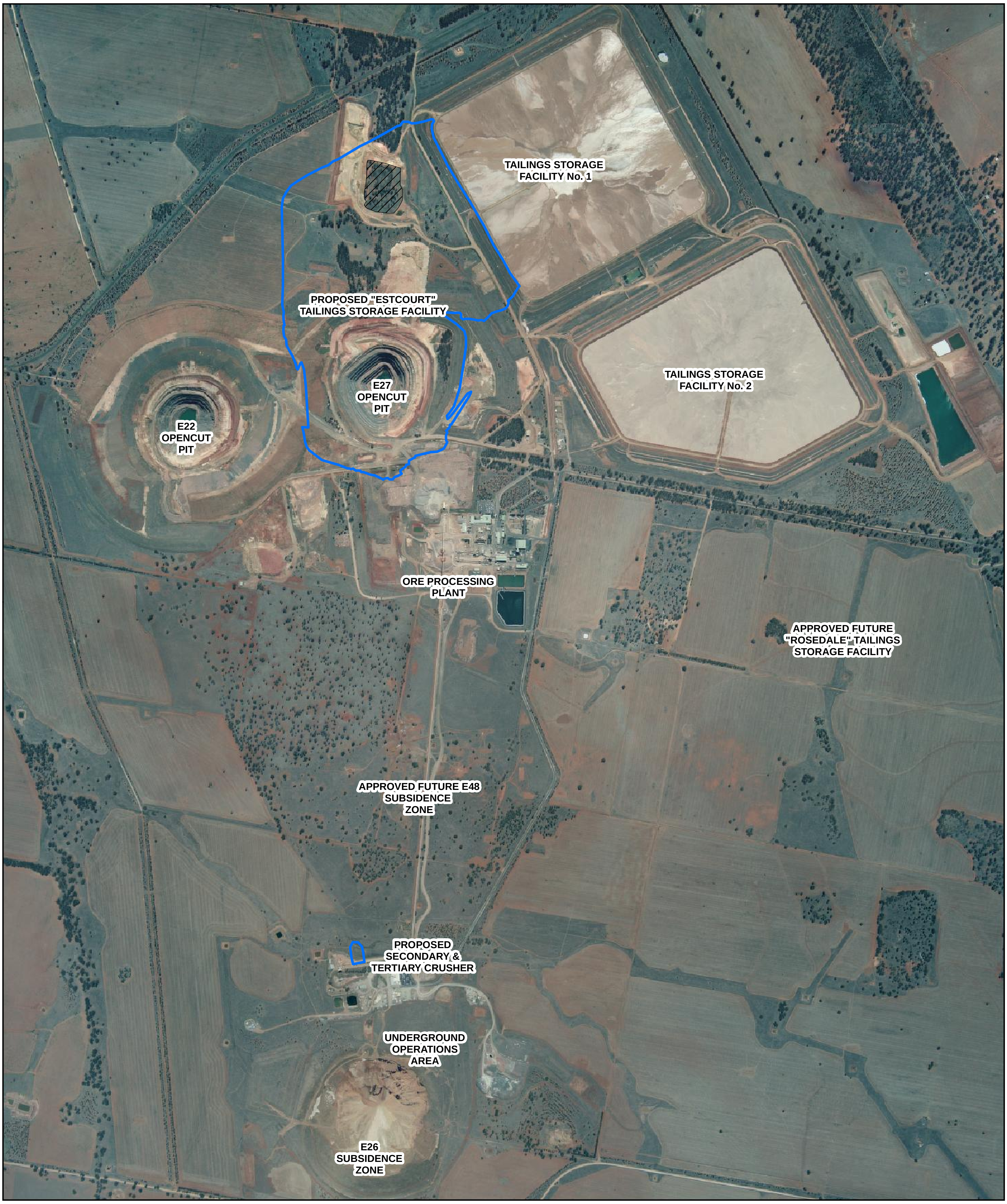
- Construction of a new tailings storage facility ("Estcourt" TSF); and
- Increase operational throughput limit from 6.5 million tonnes of ore per year to 8.5 million tonnes of ore per year processed.

Figure 1-1 shows the key features of the NPM site.

GHD was engaged to provide an air quality assessment of the potential impacts of the proposed modifications on the nearest sensitive receptors. The scope of work of the air quality assessment was to:

- Check that the construction activities associated with the proposed works would comply with required air quality criteria; and
- Check that the incremental increase to potential air emissions arising from the operation of the proposed works would still comply with the required air quality criteria.

The scope of work was conducted with consideration to the to the Department of Environment and Climate Change (DECC) *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2005).



LEGEND

Disturbance Area

'Anna's Island', Approved vegetation clearing conducted September 2008.

2. Air Quality Assessment

The Northparkes Mines – E48 Project Air Quality Assessment prepared by Heggies Australia Pty Ltd (August, 2006) forms the basis of this assessment and is hereafter referred to as the 'Heggies report'.

In particular, the Heggies report assessed two scenarios:

1. *Scenario 1 (year 2008) – incorporates the development of the E48 Underground Mine including the stripping of the surface subsidence area, construction of the Tailings Storage Facility 3, work at the Rosedale Borrow Pit area and service corridor relocation. Additionally, processing plant operations have also been included as operation of the E26 Lift 2 is planned to extend to 2009; and*
2. *Scenario 2 (year 2012) – incorporates the production from the E48 Underground Mine, operation of Tailings Storage Facility 3, work at the Rosedale Borrow Pit and processing plant operations.*

The following assessment relies upon Scenario 1 to gauge construction air quality impacts and Scenario 2 to gauge operational air quality impacts.

Note that an annual production throughput of 5.5 Mt has been assumed by Heggies in both scenarios.

2.1 Construction

Construction of a new tailings storage facility (Estcourt TSF) consists of an earth wall from the north-west corner of TSF No. 1 along the north western boundary of the mine site and south to the E27 open-cut pit (refer to Figure 1-1).

The types of emissions to air during the construction process would primarily consist of dust emissions from both the mechanical disturbance and wind erosion of crustal material and exhaust emissions from the range of motor vehicle and mobile plant required for the project.

Approval for the construction of Estcourt TSF would delay the construction of TSF No. 3 (which was included as part of model Scenario 1).

The increment in air emissions attributable to the construction of the Estcourt TSF is not expected to significantly change the predicted levels of off-site impact for the following reasons:

- Standard mitigation measures would be applied to the Estcourt TSF construction emission sources as specified in the original conditions of consent for the construction of TSF No. 3;
- The proposed TSF is smaller in size and is located farther from the most exposed sensitive receptor[1] ("Avondale") than the TSF No. 3 assessed as part of Scenario 1; and

[1] The residence with the highest predicted incremental increase in dust deposition and 24-hour PM10 concentrations is "Avondale" for both Scenario 1 and Scenario 2.

- Model predictions for Scenario 1 indicate that the air quality impact increment attributable to the E48 Project represents a small fraction of the respective air quality criteria and as such the increment from the construction of the different TSF should not influence compliance.

2.2 Operation

The emission inventory used to assess the original E48 Project was derived from the application of published emissions factors. Emission factors relate the quantity of substances emitted from a source to a common activity associated with those emissions and are generally expressed as the mass of the substance emitted per unit process weight, volume, distance or duration of the given mining/construction activity (e.g. truck unloading at a TSF). The scale of each activity is likely to be proportional to the total mine throughput.

The original E48 Project was assessed on an annual production level of 5.5 Mt per annum. It is understood that that throughput may increase due to future works and demand to 8.5 Mt per annum (increase of approximately 55%). Therefore, it has been assumed that the increase in mining throughput directly translates to an increase in the estimated air emissions from the mine site of 55%.

The relationship between emission rate and the predicted ground level concentration is linear if all other discharge parameters remain constant. Hence, the pro-rata predicted ground level concentration at the most exposed sensitive receptor would be, at worst, directly proportional to the increase in the total NPM emission rate.

The pro-rata predicted ground level concentrations for Scenario 2 for each pollutant at the most exposed sensitive receptor (residence) are presented in Table 2-1.

Table 2-1 Pro-Rata Predicted Ground Level Concentrations for Scenario 2

Pollutant	Units	Original Increment Attributed to the E48 Project	Pro-Rata Increment Attributed to the Modified E48 Project (6)	Back-ground	Back-Ground + Pro-Rata Increment	Air Quality Impact Criteria
Dust	g/m^2/month	0.6 (1)	0.9	2.7	3.6	4
PM_{10}	$\mu g/m^3$ (24-hour)	2.9 (2)	4.5	45.9	50.4	50
PM_{10}	$\mu g/m^3$ (annual)	1.3 (3)	2.0	17.6	19.6	30
SO_2	$\mu g/m^3$ (1-hour)	9 (4)	14	0	14	570
NO_2	$\mu g/m^3$ (1-hour)	116 (5)	180	0	180	246

(1) Taken from Heggies report, Table 10;

(2) Taken from Heggies report, Table 11;

(3) Taken from Heggies report, Table 13;

(4) Taken from Heggies report, Table 14;

(5) Taken from Heggies report, Table 15; and

(6) Original increment scaled by a factor of 1.55 (i.e. 55% increase).

Table 2-1 shows that the total impact (increment plus background) associated with the proposed works are predicted to be below the respective air quality criteria at the most exposed sensitive receptor, except for a marginal exceedence of the PM_{10} (24-hour average) criterion.

It is evident from the data presented in Table 2-1 that the predicted incremental PM_{10} impact is low, at less than 10% of the 24-hour PM_{10} criterion, and that the adopted background PM_{10} concentration comprises the bulk of the criterion. However, it should be noted that the highest predicted incremental increase in 24-hour average PM_{10} concentrations at the most exposed residence was 30 $\mu g/m^3$ (refer to Table 12 in the Heggies report), which translates into a pro-rata maximum incremental concentration of 46 $\mu g/m^3$, which is approximately 92% of the PM_{10} criterion in the worst case[2]. Hence, it is clear that the background PM_{10} concentration is the critical factor in determining compliance with the PM_{10} criterion.

The time varying background PM_{10} data used in the Heggies report was not site specific but was considered, by Heggies, to be a conservative estimate of background PM_{10} levels in the vicinity of the mine site.

[2] The second and third highest predicted increment were 28.4 and 23.3 $\mu g/m^3$ respectively. The remainder were less than 20 $\mu g/m^3$.

NPM has recently modified its air quality monitoring program to include PM_{10} monitoring at the location of local residences using high volume air samplers fitted with a size selective inlet to collect samples for 24 hours every sixth day. Preliminary data collected between March and September 2008 is presented in Figure 2-1. The mean 24-hour PM_{10} concentration is approximately 16 µg/m^3 and ranges from 4 to 75 µg/m^3, with three recorded exceedences of the PM_{10} criterion of 50 µg/m^3. Note that these measured PM_{10} concentrations include the potential contribution of particulate emissions from NPM operations.

GHD expect that a reasonable representation of the background PM_{10} 24-hour concentration levels (i.e. excluding the mine contribution) would be in the order of 5 – 15µg/m^3 for this type of rural environment. Hence, it is likely that the impact of PM_{10} emissions from proposed works would be below the PM_{10} criterion on a day-to-day basis, provided the specific design and operational safeguards documented in the Heggies report are implemented.

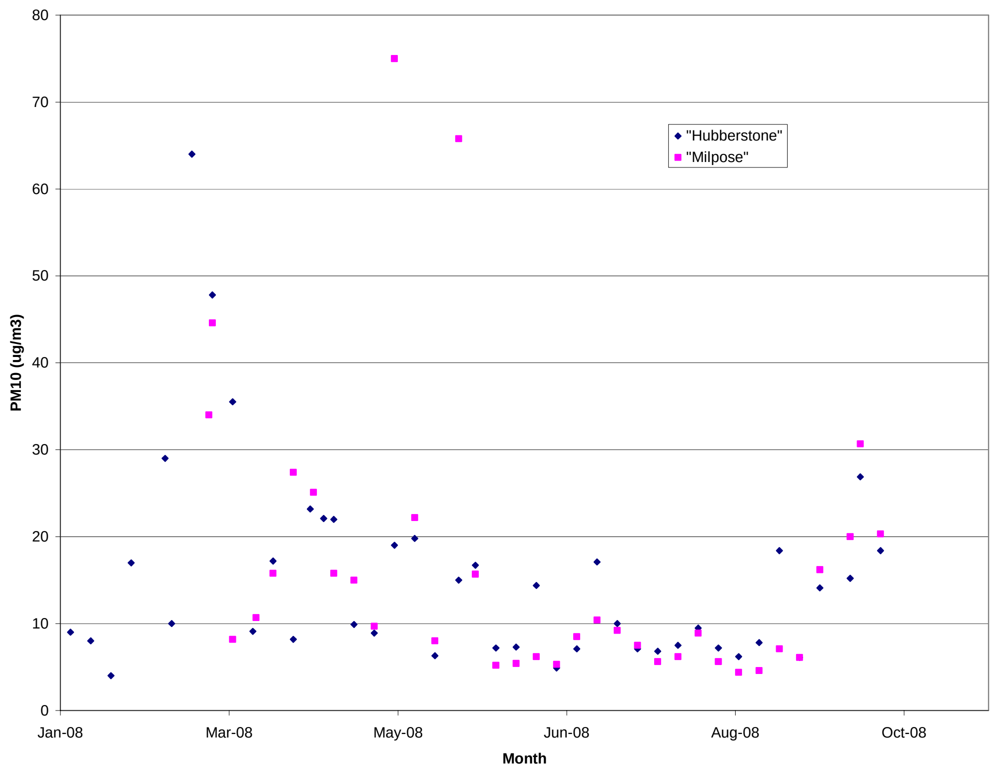


Figure 2-1 PM_{10} Monitoring Results – January to October 2008

3. Conclusions

The proposed works, including construction activities, are expected to still comply with the required air quality criteria and management measures specified in the original Northparkes Mines – E48 Project Environmental Assessment report and conditions of consent, with the exception of compliance with the 24-hour PM_{10} criterion under 8.5 Mt throughput operations, which was determined to be marginal.

The 24-hour PM_{10} increment attributable to the proposed works was conservatively estimated to remain below the PM_{10} criterion in the worst case. However, in the assessment of total impact (increment plus background), it is clear that the specification of a representative background PM_{10} concentration is the critical factor in determining compliance with the PM_{10} criterion. If it is assumed that the background PM_{10} 24-hour concentration in the order of 5 – 15µg/m^3 it is likely that the total impact of PM_{10} emissions from proposed works would be below the PM_{10} criterion on a day-to-day basis, provided the specific design and operational safeguards documented in the Heggies report are implemented.

The conclusions given above are subject to the limitations described in Section 4.

4. Limitations

This report has been prepared for North Mining Limited in order to comply with local regulatory requirements. The purpose of the report is to provide an independent review of the Project and assess the potential impact of local air quality of the Project.

It is not the intention of the assessment to cover every element of the ambient environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the air quality assessment represent the findings apparent at the date and time of the monitoring and the conditions of the area at that time. It is the nature of environmental monitoring that not all variations in environmental conditions can be accessed and all uncertainty concerning the conditions of the ambient air environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

The air quality mitigation measures recommended in this report are in-principle only.

In conducting this assessment and preparing the report, current guidelines for air quality were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

GHD

352 King St Newcastle NSW 2300
PO Box 5403 Hunter Region Mail Centre NSW 2310
T: (02) 4979 9999 F: (02) 4979 9988 E: ntlmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft A	S Anderson	G Collins	*G Collins*	G Collins	*G Collins*	7/11/08
Draft B	S. Anderson	G Collins	*G Collins*	G Collins	*G Collins*	11/11/08
0	S Anderson	G Collins	[illegible]	G Collins	[illegible]	4/12/08

Appendix D

Ecological Assessment

CLIENTS | PEOPLE | PERFORMANCE

Northparkes Mines

Report for NPM Section 75W Modification

Ecological Impact Assessment

February 2009

Contents

Table Index

Figure Index

Appendices

1. Introduction

1.1 Proposed Development

This Ecological Impact Assessment for proposed modifications to the Northparkes Mines (NPM) site will form part of the Environmental Assessment Report (EA). The proposed modifications to Development Consent 06-0026 (DC 06-0026) that will be considered in the environmental assessment are:

- Construction of a new tailings storage facility "Estcourt" including any associated floor preparation and drainage system;
- Increasing the limit on approval to 8.5 million tonnes of ore processed per year;
- Extending the life of the mine through to 2025 through more efficient mining of the E48 resource;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations; and
- Upgrades and modifications to existing processing infrastructure including:
  - Module 1 and 2 Grinding Circuits;
  - Module 1 and 2 Flotation Circuits;
  - Module 3 Flotation Circuit;
  - Concentrate Handling Facilities; and
  - Tailings Handling Facilities.

A *Flora and Fauna Assessment* was prepared as a specialist study to accompany the *Environmental Assessment* - *Northparkes Mines E48 Project* (RW Corkery, 2006). The above mentioned assessment addressed potential impacts on native flora and fauna arising from the E48 Project, including the establishment of a tailings storage facility, borrow pits and proposed subsidence area for the E48 underground mine. The study area for the above mentioned assessment encompassed an approximate area of one kilometre surrounding the E48 Project footprint. This included survey effort within the s.75 modification area, however not all areas within the study area were surveyed in sufficient detail to assess potential impacts on native flora and fauna arising from the proposed modification.

This supplementary flora and fauna survey has been undertaken to obtain an up to date assessment of conservation significance and assess any likely impacts on flora and fauna associated with the proposed modification.

The site location is shown on Figure 1. The layout of the site and s.75 modification area is shown on Figure 2 and includes the current survey area and areas approved for development under previous agreements.

The following definitions apply to this assessment:

- '*s.75 modification area'* : the area assessed directly in this report, comprising the surface disturbance area for the proposed activity;
- '*the site*' : the Northparkes Mines site, incorporating the s.75 modification area, existing mine operations and agricultural lands under the tenure of Northparkes mines;
- '*study area'* : the area covered by the current assessment, including the s.75 modification area, surrounding portions of the site and the study areas for previous assessments in the vicinity which were included in the literature review for this assessment; and
- *'the locality'* : the area within a 10km radius around the site.

1.2 Scope of Report & Director General's Requirements

GHD Pty Ltd (GHD) was engaged by NPM to undertake this Ecological Assessment. The proposal is a modification Major Project pursuant to *State Environmental Planning Policy (Major Projects)*. Accordingly, the proposal is subject to the development and assessment processes and requirements of Part 3A of the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act), with the Minister for Planning as the consent authority.

This Report has been prepared as a technical document to support the EA, and addresses the Director General's Requirements (DGRs), which state that the Biodiversity assessment must follow the NSW Department of Environment and Climate Change (DECC) *Guidelines for Threatened Species Assessment (DEC, 2005)*' under Part 3A of the EP & A Act 1979 and the NSW Groundwater Dependant Ecosystem Policy (DLWC).

The DEC (2005) guidelines identify important factors and/or heads of consideration that must be considered by proponents and consultants when assessing potential impacts on threatened species, populations, or ecological communities, or their habitats for development applications assessed under Part 3A. The guiding principles outlined in the guidelines and addressed in the current assessment are as follows:

- 'Maintain or improve' biodiversity values (i.e. there is no net impact on threatened species or native vegetation).
- Conserve biological diversity and promote ecologically sustainable development.
- Protect areas of high conservation value (including areas of critical habitat).
- Prevent the extinction of threatened species.
- Protect the long-term viability of local populations of a species, population or ecological community.
- Protect aspects of the environment that are matters of national environmental significance.'

The assessment is designed to provide information and analysis to demonstrate that feasible alternatives have been considered, that the project has been designed to be consistent with the principles outlined above, and where there are impacts, that adequate mitigation measures and biodiversity offsets are implemented.

Consideration was also given to the *DEC Draft Threatened Biodiversity Survey and Assessment Guidelines* (2004) with regards to the scope and timing of flora and fauna surveys.

1.3 Relationship with existing studies and approvals

GHD understands that a *Flora and Fauna Assessment* was prepared by Geolyse (fauna, habitat, ecological impact assessment) and BTEQ (flora) in 2006 as a specialist study to accompany the *Environmental Assessment - Northparkes Mines E48 Project* (RW Corkery, 2006). The above mentioned assessment addressed potential impacts on native flora and fauna arising from the E48 Project and included some survey effort within the footprint for the proposed modification.

A number of vegetation communities identified in the E.48 EA (RW Corkery, 2006) were inconsistent with identifications made by GHD field ecologists during the GHD October 2008 field survey. These discrepancies have implications for assessment under the Threatened Species Conservation Act (and its gazetted amendments) as well as under Part 3A of the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act). In particular:

- An area mapped as EPBC Act Critically Endangered Ecological Community Grassy White-box Woodland was found to contain a Grey Box Woodland dominated by Grey Box (*Eucalyptus microcarpa*) and consistent with the TSC Act listed EEC "Inland Grey Box Woodland";
- No areas of TSC Act listed EEC were identified, whereas the majority of grassy *Eucalyptus* dominated communities in the region would meet the DECC identification criteria for one or more EECs (refer DECC, 2008b); and
- Native vegetation with the proposed modification footprint was not mapped.

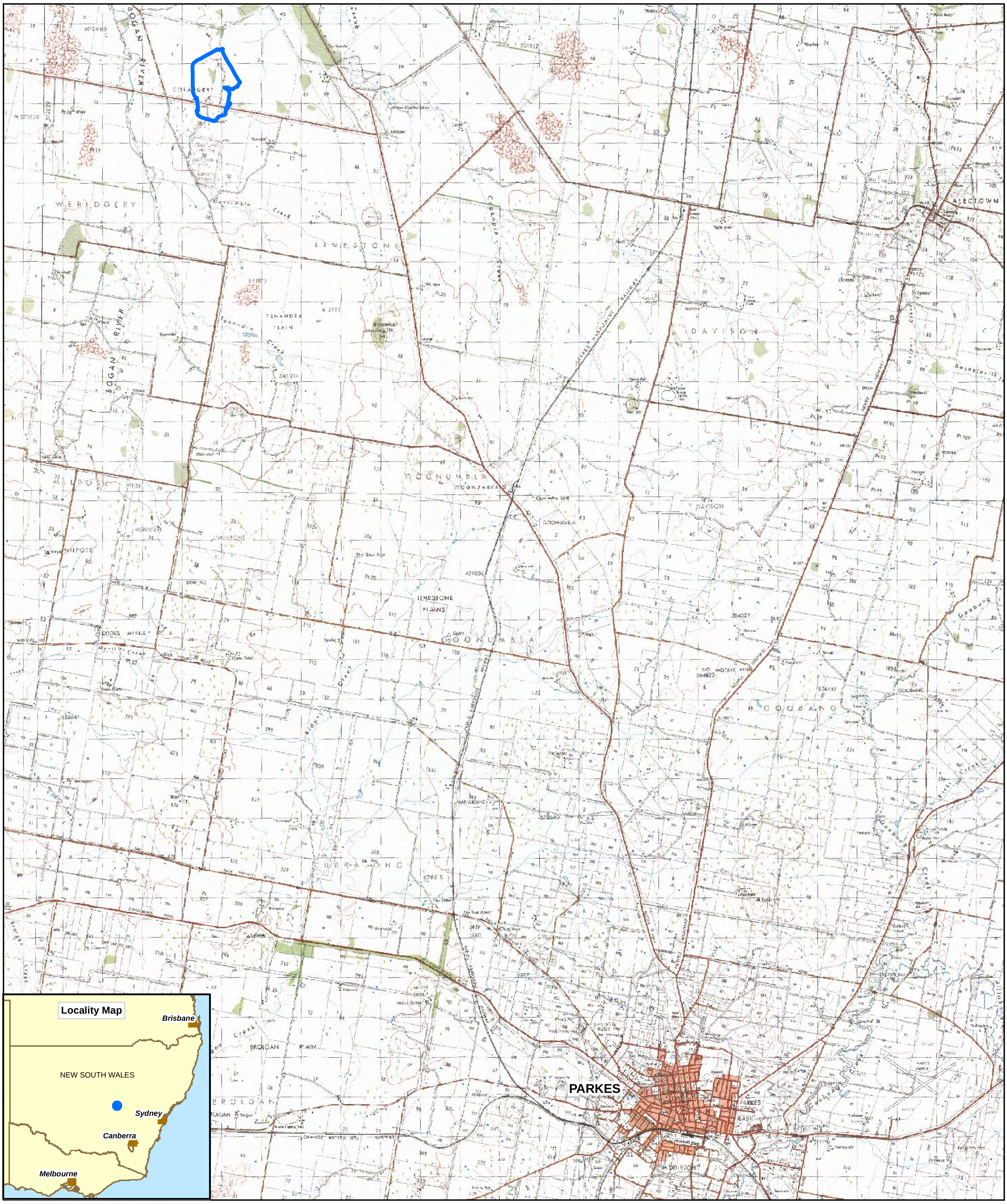
These discrepancies are likely to be attributed to the different scope of the two assessments. The proposed modification footprint is remote from the E48 infrastructure assessed in the RW Corkery (2006) E48 EA. These areas may not have been surveyed in the same detail as vegetation within the surface disturbance footprint for that project.

The approach adopted in this assessment has been to survey all areas within the proposed modification footprint and to assess on the basis of conditions observed during GHD field surveys. No further survey of the broader locality or verification of the vegetation mapping or habitat for threatened species identified in the E48 EA (RW Corkery, 2006) was performed.

The measures already applied to the treatment and management of contaminated tailings water and sediment is assumed to have already been assessed in RW Corkery (2006) and approved accordingly. This report assumes that the management practices will envelop the additional works described in this assessment and that the impacts on fauna, particularly water birds, waders and flow on predators has been encapsulated in previous assessments and measures employed to reduce the risk of heavy metal and metal salt accumulation in the ecosystem.

It is also assumed that any groundwater dependant ecosystems in the region and locality of the site were assessed in the RW Corkery (2006) assessment. No groundwater dependant ecosystems were identified by RW Corkery (2006), nor were any recorded in the current GHD assessment. It is assumed that the management measures adopted in DC 06-0026 would adequately address potential impacts on local and regional groundwater flows.

Some patches of remnant vegetation visible on Figure 2 and within the s.75 modification area had been previously approved for clearing or disturbance. One area 'Anna's Island' was assessed in the RW Corkery (2006) E48 EA and approved for clearing in DC 06-0026. This vegetation was removed in September 2008 (GHD, 2008) prior to the current assessment.



LEGEND

Disturbance Area

1:90,000 (at A3)

0 375 750 1,500 2,250 3,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

CLIENTS | PEOPLE | PERFORMANCE

NorthParkes Mines
Section 75W Modification for NPM

Job Number	21-17903
Revision	A
Date	12 NOV 2008

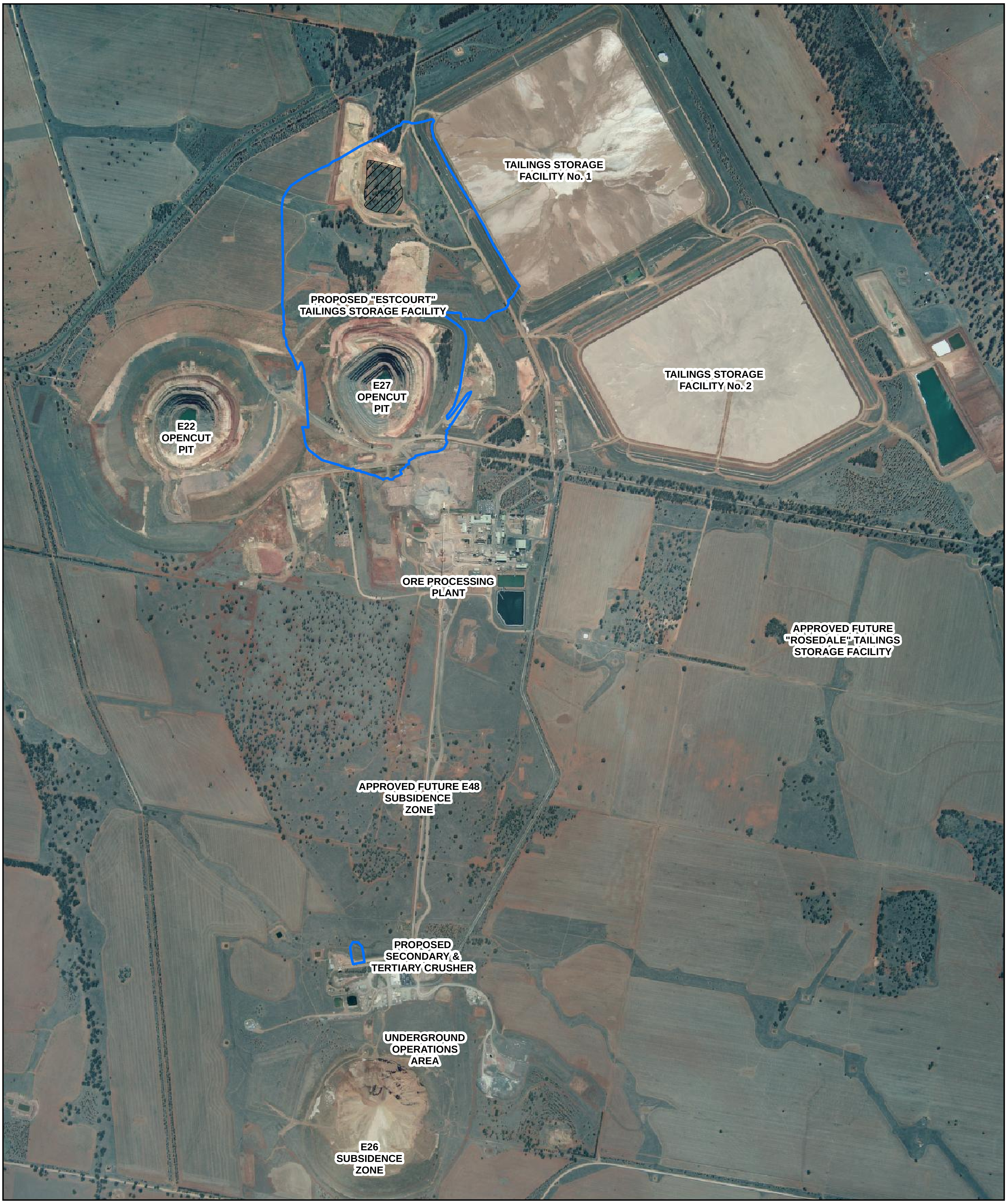
Site Location

Figure 1

G:\21\17903\CADD\GIS\MapDocument\Z002_SiteLocation.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008. Created by: RCJOHNSON



LEGEND

Disturbance Area

'Anna's Island', Approved vegetation clearing conducted September 2008.

1:18,000 (at A3)

0 115 230 460 690 920

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

CLIENTS | PEOPLE | PERFORMANCE

NorthParkes Mines
Section 75W Modification for NPM

Job Number	21-17903
Revision	A
Date	18 DEC 2008

Site Layout

Figure 2

G:\21\17903\CADD\GIS\MapDocument\Z003_SiteLayout.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Sources: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON

2. Site Description

2.1 Site Location & Layout

Northparkes Mine (NPM) is located approximately 27 kilometres north west of Parkes in the Parkes Local Government Area (LGA), central western New South Wales. The mine has both underground and open-cut operations and has been in operation for 14 years.

The surrounding landscape is dominated by agricultural land that has been largely cleared and is utilised primarily for cropping. The landscape is generally flat to gently undulating the region contains the catchments for the Bogan and Lachlan Rivers. The study area is within the Southwest Slopes Bioregion as defined in the *Interim Biogeographic Regionalisation for Australia* (Thackway and Cresswell, 1995). This bioregion forms the western slopes and plains of the Great Dividing Range.

As shown on Figure 2 the proposed s.75 modification area consists of two main surface disturbance areas:

- The proposed Estcourt tailings storage facility in the north of the NPM site adjacent to the existing E27 opencut pit; and
- The proposed secondary and tertiary crushers in the south of the NPM site adjacent to the existing underground operations area.

2.2 Geology, Soils and Topography

The NPM operations are located within the Lachlan Fold Belt of Central Western NSW, which incorporates the Bogan Gate Synclinorial Zone around Parkes and has been host to many mineral discoveries of local, regional and national importance. Four primary areas of mineralisation have been identified within the NPM operations lease area, namely E22, E26, E27 and E48. All of these deposits occur along the northeastern corner of the Bogan Gate Trough, part of the Lachlan Fold Belt. The copper-gold deposits at the NPM operations are hosted by the Goonumbla Volcanics, which comprise a sequence of volcanic and sedimentary units of Ordovician age (approximately 460 million years ago) (RW Corkery, 2006).

Geoff Cunningham Natural Resource Consultants (2006) identified two naturally occurring Soil Mapping Units (SMUs) across the S.75 modification area, with SMU1 largely associated with soils on slightly elevated areas of topography and SMU2 associated with mid and lower slopes, level plains and drainage depressions. GHD field staff identified two further highly-modified SMUs during field surveys: overburden stockpiles and topsoil stockpiles. These two units were identified as a guide to the assessment of native vegetation and habitat. The characteristics of the soil were not described in detail.

Table 1 Description of soil mapping units at Northparkes Mine

Soil Unit	SMU1	SMU2	Overburden stockpiles	Topsoil stockpiles
Soil profile	To 88cm deep, firm to hardsetting surface.	To 280cm deep, firm to self-mulching surface, sometimes loose, soft or hardsetting.	To 20m deep. No horizon development. Firm to hardsetting surface. Silty clay to heavy clay. Local surface erosion. Abundant gravel and stones. Few roots.	To approx 150cm deep. No horizon development. Firm to hardsetting surface. Loam to silty clay. Little surface erosion. Many roots present.

Soil Unit	SMU1	SMU2	Overburden stockpiles	Topsoil stockpiles
Topsoil	Loam sandy clay loam or clay loam, no gypsum, lime or manganese present, pH 5.0 to 7.0, many roots present, some grave and stone, highly pedal, consistency dry and usually hydrophobic.	Silty clay to heavy clay, roots common, no lime, gypsum or manganese present, pH 5.0 to 6.0 (occasionally outside this range), no gravel or stones, highly pedal, firm to strong consistency dry and sometimes hydrophobic.	Not applicable.	Not applicable.
Subsoil	Two subsoil horizons evident, texture becomes increasingly clayey with depth, sandy light clay to heavy clay, some roots present, no lime or gypsum present, some manganese at depth, some gravel, pH 5.5 to 7.5, highly pedal or massive, very firm to strong, consistency dry, usually not hydrophobic.	Up to five distinct horizons, clay texture throughout with horizons sometimes becoming gritty near bedrock, usually highly pedal, mottles increase with depth.	Not applicable.	Not applicable.
Vegetation	Box woodland, Native grassland or dense low shrub land or grassland dominated by exotic environmental weeds.	Small area of Box woodland in north of site -remainder -Wheat crop or dense low shrub land or grassland dominated by exotic environmental weeds.	Very sparse cover of exotic plants. Mainly bare earth.	Dense low shrub land or grassland dominated by exotic environmental weeds.

Source: Geoff Cunningham Natural Resource Consultants (2006); RW Corkery and Co (2006).

Geoff Cunningham Natural Resource Consultants (2006) concluded that farming practices implemented across the NPM site such as soil conservation works, conservation tillage practices, stubble retention and an absence of livestock grazing, has helped to minimise erosion and has maintained the NPM site farm land soils in a generally stable state. This was also the case during the GHD (2008) field surveys, which noted minor, localised erosion in intact native vegetation, agricultural crops and topsoil stockpile areas.

NPM is located on the edge of the inland slopes beyond the Great Dividing Range. The surrounding landscape is generally flat with some low undulations ranging from 280m AHD to 300m AHD, with some higher peaks. The most significant topographical features in the region are Goonumbla Hill (386m AHD) located immediately south of NPM. NPM is located amongst relatively flat topography, with the significant topographic features of NPM created through previous mining activity. The highest near-natural point of the NPM is 301m AHD in the southeast, with topography reaching a low of 288m AHD to the west. Topographic slopes from east to west range from 1:30 to 1:170 (V:H). Mining activities have created topographic highs in the form of tailings storage facilities (TSF) and waste rock stockpiles and topographic lows formed by the two open cut mines (E22 and E27) and the E26 subsidence zone (Corkery and Associates, 2006).

The pits for the open cut and associated roads, TSFs, laydown areas, processing plant and overburden storage areas have extensively modified the local topography within the s.75 modification area. Small areas of native vegetation remain on near-natural landscapes with mature trees and intact topsoil. The remainder of the site consists of highly modified landscapes covered by infrastructure, bare earth or exotic plants.

2.3 Hydrology

The Parkes regional area is drained by two major river systems, the Bogan-Macquarie and the Lachlan River systems, both of which are major tributaries of the Murray-Darling River system. The NPM site is close to the catchment boundary separating the Bogan River and the Lachlan River, but is entirely encompassed by the Bogan River catchment. The broader NPM site contains four sub-catchments, feeding tributaries of the Bogan River. One tributary, Goonumbla Creek, traverses the southern part of the NPM site in the immediate vicinity of the proposed secondary and tertiary crushers (WRM, 2006; Corkery and Associates, 2006).

The existing NPM operations have significantly modified the drainage characteristics of these four catchments. Open cut voids and overburden stockpiles have significantly altered the topography of the catchments. Further, extensive drainage interception works have been constructed to ensure that all potentially ‘dirty’ or ‘contaminated’ surface water runoff from disturbed areas is collected and prevented from flowing to natural watercourses. There are numerous large water storages on the NPM site as shown on Figure 2. There are also a large number of retention ponds, sediment ponds and stilling ponds. The retention ponds collect potentially contaminated water for recycling through the process water circuit, sediment ponds collect surface water runoff containing sediment for settling, with the water evaporating returned to the process water circuit, and the stilling ponds provide holding capacity in the event of a burst in the tailings pipeline. Large voids, such as the E22 and E27 pits contain ponded surface and groundwater (WRM, 2006; Corkery and Associates, 2006). Finally, ephemeral wetlands form across considerable areas of the site after intense rainfall events. These are unnatural features that can be attributed to a combination of the exposure of poorly draining subsoils and concentration of surface runoff by mining activities.

2.4 Climate

Weather statistics are taken from the nearest weather station to the site (Parkes) (BOM, 2008). The area experiences a mean maximum annual temperature of 23.4^{o} celsius and a mean minimum annual temperature of 10.9. The average annual rainfall is 583.6 mm at Parkes, the NPM site had received good rainfall in the month preceding field surveys: over the period 1 to 16 October Parkes received 31.4 mm of rainfall.

3. Legislative Framework

3.1 Environmental Planning & Assessment Act 1979

The EP&A Act forms the legal and policy platform for development assessment and approval in NSW and aims to, *inter alia*, ‘encourage the proper management, development and conservation of natural and artificial resources’. The proposal is a Major Project according to *State Environmental Planning Policy (Major Projects) 2005* and as such, is to be assessed under the provisions of Part 3A of the EP&A Act, with the Minister for Planning as the Consent Authority for the Project Application.

A Section 75W modification for the proposed works at NPM is required to account for changes in the current approved project in accordance with the requirements of the NSW EP&A Act.

3.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides legal status for biota of conservation significance in NSW. The Act aims to, *inter alia,* ‘conserve biological diversity and promote ecologically sustainable development’. It provides for:

» The listing of ‘threatened species, populations and ecological communities’, with endangered species, populations and communities listed under Schedule 1, ‘critically endangered’ species and communities listed under Schedule 1A, vulnerable species and communities listed under Schedule 2;

» The listing of ‘Key Threatening Processes’ (under Schedule 3);

» The preparation and implementation of Recovery Plans and Threat Abatement Plans; and

» Requirements or otherwise for the preparation of Species Impact Statement (SIS).

The TSC Act has been addressed in the current assessment through:

» Desktop review to determine the threatened species, populations or ecological communities that have been previously recorded within the locality of the site and hence could occur subject to the habitats present;

» Targeted field surveys for threatened species listed under the Act;

» Development of suitable impact mitigation and environmental management measures for threatened species, where required; and

» Assessment of potential impacts on threatened species.

3.3 Native Vegetation Act 2003

The NSW Government released the regulations for the *Native Vegetation Act 2003* (NV Act) on 14 November 2005, which came into effect on 1 December 2005. The NV Act regulates the clearing of native vegetation on all land in NSW except for land listed in Schedule 1 of the Act. Excluded land under Schedule 1 of the Act includes National Parks and other conservation areas, State forests and reserves, and urban areas. Specifically, urban areas, which are excluded, include areas zoned residential (but not rural residential), village, township, industrial or business.

According to s.75U(e) of the EP&A Act, an authorisation under Section 12 of the NV Act to clear native vegetation is not required for a project approved under Part 3A. Hence, the NV Act does not apply to the current proposal.

3.4 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act)*,* provides for the declaration of noxious weeds by the Minister of Agriculture. Noxious weeds may be considered noxious on a National, State, Regional or Local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the NW Act. As such, if present, noxious weeds on the site should be controlled in accordance with the control category specifications.

3.5 State Environmental Planning Policy 44 – Koala Habitat Protection

State Environmental Planning Policy 44 (SEPP 44) aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline'.

Schedule 1 of SEPP 44 lists the local government areas to which SEPP 44 applies. The site is within Parkes LGA. Parkes LGA is listed under Schedule 1.

SEPP 44 requires that before granting consent for development on land over 1 hectare in area, a consent authority must be satisfied as to whether or not the land is 'potential' and 'core' koala habitat. Potential koala habitat is defined as 'an area of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component'.

Core koala habitat, is defined as 'an area of land with a resident breeding population of koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population'. Where core koala habitat is found to occur, SEPP 44 requires that a site-specific Koala Plan of Management be prepared.

As discussed in **Section 4**, SEPP 44 was addressed by targeted surveys for Koalas and Koala feed trees and searches for signs of recent Koala activity.

3.6 Environment Protection and Biodiversity Conservation Act

The purpose of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a project, undertaking, development or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Commonwealth Minister for the Environment and Water Resources.

In January 2007 the Commonwealth and NSW governments signed a Bilateral Agreement which accredits the assessment regimes under Part 3A, Part 4 and Part 5 of the EP&A Act for assessment purposes under the EPBC Act. The Bilateral Agreement applies only to proposals that the Commonwealth Environment Minister has determined are controlled actions under the EPBC Act, with the exception of nuclear actions (DoP 2007).

The EPBC Act identifies matters of national environmental significance as:

» World heritage properties;

» National heritage places;

» Wetlands of international importance (Ramsar wetlands);

» Threatened species and ecological communities;

- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

The Administrative Guidelines for the EPBC Act (Department of the Environment & Heritage 2006) set out criteria intended to assist in determining whether an action is controlled and hence requires approval. In particular, the Guidelines contain criteria for determining whether a proposed action is likely to have a 'significant impact' on a matter of national environmental significance (NES). Should the proponent deem the proposal likely to have a significant impact on a matter of NES, a referral to the Commonwealth Minister for the Environment would be undertaken to obtain a determination as to whether the proposal is a 'controlled action' requiring Commonwealth approval.

The EPBC Act has been addressed in the current assessment through:

- Desktop review to determine the threatened species or ecological communities that have been previously recorded within the locality of the site and hence could occur, subject to the habitats present;
- Targeted field surveys for species and ecological communities listed under the Act;
- Development of suitable impact mitigation and environmental management measures for threatened species, where required; and
- Assessment of potential impacts on threatened species.

4. Methodology

4.1 Literature Review

A desktop literature review was undertaken by GHD to identify the representative spectrum of flora and fauna, threatened species, populations and ecological communities listed under the NSW TSC Act and the Commonwealth EPBC Act that could be expected to occur within the study area, based on habitats present. To this end, the following documentation was reviewed prior to the field investigations:

- Northparkes Mines - E48 Project Flora and Fauna Assessment (Geolyse, 2006), incorporating the BTEQ (2006) Flora Assessment;
- *Anna's Island Pre-clearing survey* (September 2008), Unpublished report by GHD for Northparkes Mine (Our reference: 12857/72487);
- *Northparkes Mine Pre-clearance survey* (December 2007), Unpublished report by GHD for Northparkes mine (our reference: 2312359/71015);
- The NSW NPWS Wildlife Atlas database (October 2008– Data for the Forbes 1:100,000 Map Sheet. Additional Parkes LGA search for TSC Act listed flora and fauna. The Lower Slopes CMA Sub region was searched for EECs); and
- EPBC online Protected Matters Database (October 2008 – within the Parkes LGA; database query re-checked December 22, 10km wide polygon centred on the site).

4.2 Field surveys

A targeted flora and fauna survey was performed by GHD ecologists from 13 to 15 October 2008. Survey effort is presented on Figure 3. Survey methodology is described below.

4.2.1 Flora Survey

The primary objective of the survey was to:

- Map and describe the vegetation communities occurring within the study area;
- Compile a flora list of those species occurring within the vegetation communities, identifying any threatened, nationally, regionally or locally significant species and communities; and
- Assess the likely impacts of the proposed development and provide recommendations to assist in minimising impacts to flora in the study area.

Flora surveys were consistent with the DECC guidelines (DEC 2004). All vascular plants (ie not mosses, lichens or fungi) observed were recorded on appropriate pro-forma field data sheets.

Plant specimens that could not be identified quickly in the field were collected and subsequently identified using standard botanical texts and where required were compared with voucher specimens held in the National Herbarium of New South Wales Online Reference Collection. Structural vegetation communities were described according to classifications made by Specht (1970). Plant identifications were made according to nomenclature in Harden (1990, 1991, 1992, and 1993). Plant specimens which were difficult to identify (either insufficient sample collected or buds/fruiting bodies were not available at the time of the survey) were submitted to the NSW National Herbarium for identification or identified to Genus level where appropriate (i.e. introduced species).

On the basis of air photo interpretation, and field habitat assessment, the site was divided into stratification units i.e. functionally similar units for the purposes of environmental assessment according to the DECC guidelines (DEC 2004). Survey effort included six 20m x 20m quadrats positioned to define native vegetation communities at the site. Four random meander transects of approximately 300m by 10m were performed through regrowth, planted and/or highly disturbed communities noting all plant species present. Additional Ransom Meander surveys were also performed through all areas of suitable habitat, noting any species not detected in other surveys as well as any threatened species.

Plant species were recorded on appropriate pro forma field data sheets. Each species list was accompanied by a detailed biophysical description including vegetation structure, soils, geology and geomorphology, habitat and fire and disturbance history.

The location of field survey quadrats and significant species, habitat and communities were captured with a handheld GPS unit. The locations of the vegetation survey quadrats are shown in Figure 3.

4.2.2 Fauna Survey

Targeted fauna surveys were generally consistent with the DECC guidelines (DEC 2004). The survey design was based on the likelihood of threatened species identified in the literature review occurring on site and the initial habitat assessment. Methods included diurnal bird counts, Anabat recording, active searches, nocturnal call playback, stag watches, spotlighting, opportunistic observations and track and scat analysis. The timing of surveys was consistent with the DECC guidelines which recommends surveys between October and March for bats, frogs and reptiles (DEC 2004). All observations were recorded on appropriate pro forma field data sheets.

Weather during the field survey was generally warm to hot with occasional heavy rain. Overall 10.6 mm of rain fell during the survey period. There was standing water in drainage ditches, dams and wetlands across the site and frogs were actively calling. The rainfall that fell on the 14 October fell primarily between the hours of 10:00 am and 1:00 pm while the rainfall that fell on the 15 October primarily occurred in the early hours of the morning. Weather conditions were suitable for the detection of frogs at the site. Weather conditions on 14 and 15 October may have been too cool for the detection of native reptiles potentially present at the site. Wind during dawn bird surveys was light to moderate.

Table 2 Daily weather observations at Parkes during the survey period (BOM, 2008)

Date	Minimum temp (Deg cel)	Max temp (Deg cel)	Rainfall (mm)
12/10/2008	12.0	27	0.0
13/10/2008	16.5	28.0	0
14/10/2008	16.0	22.6	4.6
15/10/2008	4.8	21.0	6.0

There was a close-to-full moon throughout the survey period and moderate to high light spill from human sources due to the nearby operating portions of the mine. Traffic along the nearby haul roads was very light, with less than ten vehicle movements per hour. Conditions through the nocturnal surveys were sub-optimal for the detection of small nocturnal fauna, however were suitable for observing nocturnal birds and larger mammals.

Diurnal Bird Counts

Diurnal bird counts consisted of area searches through habitat on site. Searches were conducted at dawn and dusk, for at least 40 minutes over approximately 1 Ha consistent with the DECC guidelines (DEC 2004). Opportunistic observations of bird species were recorded throughout the duration of all surveys on the site. Species were identified by visual observation and call and were documented along with numbers of individuals, behaviour, breeding activity and habitat type on proforma data sheets.

Trees were also scanned for nests, whitewash and roosts throughout the study area and their locations captured with a handheld GPS unit.

Active Searches

Active searches for frogs and reptiles were performed within and adjacent to the site focussing on wetlands and suitable substrate. Wetland areas were systematically searched and semi-aquatic vegetation was visually scanned. Shelter sites were carefully lifted and replaced, trunks and decorticating bark were scanned and visual scanning of vegetation for active and foraging specimens was undertaken. Frogs were identified by sight and by call.

Microchiropteran Bat Survey

Fixed Anabat recordings were undertaken, recording from half an hour before dusk until the following morning. Two Anabat units were placed for two nights on 13 and 14 October 2008. Overall four full nights of bat call recordings were taken. Recordings were sent to Ray Williams of Ecotone for identification. Calls were identified to species level where possible and were reported as ‘definite’, ‘probable’ or ‘possible’ depending on the confidence of the identification.

Call Playback

Call playback was performed over two nights targeting the Squirrel Glider (*Petaurus norfolcensis)*, Bush Stone-curlew (*Burhinus grallarius*), Koala (*Phascolarctos cinereus*), Masked Owl (*Tyto novaehollandiae*) and Barking Owl (*Ninox connivens)*.

Call playback was undertaken in accordance with DECC guidelines (DEC 2004) and included at least five minutes broadcasting and 10 minutes listening for each species per night plus additional listening and spotlighting at the beginning and end of the call playback period.

Stag Watching

Suitable hollow-bearing stags were identified during daytime habitat assessments and then watched at dusk. Stags were monitored for approximately 30 minutes before dusk and 60 minutes after nightfall. All fauna species noted during this period were recorded and any usage of roosts or hollows was recorded as appropriate.

Spotlighting

Spotlighting surveys were performed on the evenings of 13 and 14 October and involved walking transects for one hour. Nocturnal mammals birds and frogs were targeted during the spotlight period. Opportunistic spotlighting was performed each evening when deemed appropriate.

Fauna Habitat Assessment

An assessment of the quality of habitats present for native fauna was made across the entire site. Habitat quality was based on the level of breeding, nesting, feeding and roosting resources available. Indicative habitat criteria for targeted threatened species (i.e. recorded in the TSC and EPBC Act searches) were identified prior to fieldwork. Criteria were based on information provided in TSC Act species profiles, field notebooks and the knowledge and experience of GHD field ecologists. This technique is important in assisting in the compilation of a comprehensive list of fauna that are predicted within the vicinity of the site, rather than relying solely on one off surveys that are subject to seasonal limitations and may only represent a snapshot of the species present.

The locations and quantitative descriptions of significant habitat features were captured with a handheld GPS unit and photographed where appropriate.

Ground debris searches

Ground debris searches were undertaken during the entire survey period while incidentally traversing the site. These included active searches for scats, tracks, burrows or other traces.

Opportunistic Observations

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. Survey effort was concentrated on suitable areas of habitat throughout the course of the flora survey, for instance fallen timber was scanned for reptiles and paddock trees and dams were scanned for roosting birds.

4.3 Conservation significance

Conservation status of species and communities recorded across the study area were determined with reference to the following:

- The *TSC Act* for State significance; and
- The *EPBC Act* for National significance.

4.4 Staff Qualifications

Field surveys were undertaken by qualified GHD field ecologists. Staff qualifications and experience are presented in Table 3 below.

Table 3 GHD Ecology Personnel and Qualifications

Name	Position / Project Role	Qualifications	Relevant Experience
Ben Harrington	Ecologist / field surveys and reporting	Bachelor of Science, Masters of Science (Physical Geography), Macquarie University	5+ years
Michael Suidgeest	Fauna Ecologist / field surveys and reporting	Bachelor of Applied Science (Environmental), Charles Sturt University	3+ years
Leigh Maloney (Thompson)	Senior Ecologist / reporting	Bachelor of Applied Science (Environmental) Honours, Charles Sturt University	8+ years
Brendan Ryan	Senior Ecologist / technical review and QA	Bachelor of Science, Masters of Science (Environmental Science) Sydney University	11+ years
Daniel Williams	Principal Environmental Scientist / preparation of offsets strategy	Bachelor of Applied Science	10+ years

4.5 Survey limitations

It is possible that some species utilise the study area but were not detected during the survey period. These species are likely to include: flora species that flower after rainfall as well as annual, ephemeral or cryptic species; frogs which call at other times of year; and reptiles which are only active in the hottest months. Some fauna species are also mobile and transient in their use of resources and it is likely that not all species (resident or transitory) were recorded during the survey period. The habitat assessment conducted for the site allows for identification of habitat resources for such species. As such, the survey was not designed to detect all species, rather to provide an overall assessment of the ecological values on site in order to predict potential impacts of the proposal.

The proposed installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations was included in the proposed s.75 modification area after the completion of the GHD field surveys. Accordingly this area was assessed on the basis of literature review, aerial photo interpretation, ground photo interpretation and consultation with NPM staff. The surface disturbance area for the proposed crushers includes a portion of Goonumbla Creek. The creek very rarely carries surface water and does not support any aquatic habitat or riparian vegetation. The remainder of the surface disturbance area consists of existing mine infrastructure or cleared agricultural grassland (NPM Environmental Coordinator. pers. comm., GHD Senior Environmental Advisor. pers. comm.). Therefore the desktop assessment described above was considered appropriate to assess impacts in this area. Nonetheless, it is possible that this approach meant that some species or communities potentially present in this area were not detected.

LEGEND

Survey Technique

- Anabat recording
- Call playback
- Nocturnal Streamside Search
- Stag Watch
- Vegetation Quadrat

- Disturbance Area
- 'Anna's Island', Cleared September 2008
- Vegetation Random Meander Transect

1:6,000 (at A3)

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

GHD

CLIENTS | PEOPLE | PERFORMANCE

NORTHPARKES

NorthParkes Mines
Section 75W Modification for NPM

Job Number	21-17903
Revision	A
Date	18 DEC 2008

Survey Effort

Figure 3

G:\21\17903\CADD\GIS\MapDocument\Z004_SurveyEffort.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Sources: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON

5. Results

5.1 Flora

5.1.1 Flora species

A total of six 20 x 20 metre flora quadrats, three random meander transects and opportunistic observations during random meander surveys were used to compile a flora species list for the study area. A total of 94 plant species were recorded during the field survey. None of the flora species recorded are listed as threatened under the TSC and/or EPBC Acts.

The total plant species list recorded during the field survey is presented in Appendix A.

5.1.2 Vegetation communities

Vegetation communities mapped within the study area are shown on Figure 4 and described below. Native vegetation occurs as isolated remnant patches at the site, surrounded by existing disturbance including haul roads, open cut pits, retention ponds and other mine infrastructure. The largest intact vegetation patch is in the north of the study area of which only the southern most portion falls within the construction footprint for the s.75 modification. All other native vegetation in the surface disturbance area occurs as patches of under 3 ha. These patches are moderately to severely degraded by ongoing disturbance and edge effects.

Yellow Box Woodland

Yellow Box Woodland at the site features a canopy of *Eucalyptus melliodora* (Yellow Box) with a very sparse shrub layer and a grassy understorey. The canopy is dominated by sub-mature regrowth trees (10 – 30cm DBH) with a limited number of mature (30 – 60cm DBH) trees and few saplings (<10cm DBH). Grey Box (*Eucalyptus microcarpa*) and White Cypress Pine (*Callitris glaucophylla*) are sub dominant. This woodland patch does not contain a mid-storey. There is a low (<1m height), sparse layer of native shrubs including *Enchylaena tomentose (*Ruby Saltbush). The ground cover is predominantly native, dominated by the native tussock grass Corkscrew Grass (*Austrostipa setacea*) along with the scrambler Amulla (*Eremophila debilis*) and herbs Bulbine Lily (*Bulbine bulbosa*) and Fuzzweed (*Vittadenia cuneata*). However, native ground cover diversity is low (10 species) and leaf litter and bare ground made up approximately 30 percent of the ground cover.

This woodland meets the NSW TSC Act definition of the EEC “White Box- Yellow Box- Blakely’s Red Gum Woodland” (Box-gum Woodland) however does not qualify as the EPBC act listed Critically Endangered Ecological Community “White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland” (refer Section 5.1.4).

Grey Box Woodland

Grey Box Woodland is the most extensive native vegetation community within the study area. It occurs as isolated, small (<4 ha) patches within the southern section of the S.75 modification area surrounded by operating portions of the mine. There is a larger (5.8 ha) patch in the north of the study area of which 1 ha falls within the disturbance area for the S.75 modification (refer Figure 4).

The dominant species within this community is *Eucalyptus microcarpa* with scattered *Callitris glaucophylla* and Bimble Box (*Eucalyptus populnea*). The mid storey and shrub layers vary with local soil moisture and disturbance history. Groundcover also varies considerably with disturbance. Margins of woodland patches feature dense growth of exotic grasses such as *Hordeum leporinum* (Barley Grass) and *Lolium rigidum*

(Annual Ryegrass) and herbs including Pattersons Curse (*Echium plantagineum*) and Dandelion (*Taraxacum officianale*). Central portions of woodland patches feature a more natural groundcover of native tussock grasses (*Austrostipa* and *Austrodanthonia* spp.), native herbs including Kidney Weed (*Dichondra repens*) and Pussy Tails (*Ptilotus semilanatus*). Bare ground and litter made up 30 percent of the ground cover.

This community is in moderate to poor condition across the site. The majority of canopy trees are mature regrowth (30-60cm DBH) with few pre-European age trees. There are a number of standing ringbarked trees. Localised patches featured dieback of the canopy, probably due to flooding caused by earthworks associated with the operating mine. The groundcover features moderate to severe weed infestation.

A one hectare patch of Grey Box Woodland has been flooded by drainage works and features a dense understorey of Cumbungi (*Typha orientalis*). This patch falls within the s.75 modification area however is subject to approved disturbance from existing mine activities. DC 06-0026 permits in-pit tailings deposition into the E27 open cut pit and the sound bund. Flora and fauna impacts within the disturbance footprint of E27 open cut pit has been previously assessed (Corkery and Associates, 2006) and therefore this already disturbed area has not been considered further as part of this assessment (refer Figure 4).

Grey Box Woodland at the site is consistent with the TSC Act listed EEC Inland Grey Box Woodland (refer Section 5.1.4).

Bimble Box Woodland

The Bimble Box Woodland at the site occurs as an open woodland with scattered canopy of Bimble Box (*Eucalyptus populnea*). The majority of the community is regrowth however there are some mature and hollow bearing trees. *Callitris glaucophylla* and *E. microcarpa* occur as a secondary canopy species. There are small stands of mature and regenerating Weeping Myall (*Acacia pendula*) occurring as a sub-canopy and localised sub-mature plantings of *Eucalyptus*, *Casuarina* and *Acacia* species. Native and exotic groundcovers are common across the site in varying degrees of abundance. Groundcover species in this community were dominated by exotic annuals including *Hordeum leporinum* and *Sisymbrium orientale* (Oriental Mustard). Native herbs and forbs also occur within the Bimble Box woodland but they are not dominant, comprising less than 20 percent of the groundcover layer.

The Bimble Box Woodland is closely associated with Grey Box Woodland at the site and is also consistent with the TSC Act listed EEC Inland Grey Box Woodland (refer Section 5.1.4). Despite the presence of *Acacia pendula* this community is not consistent with the EEC “Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions” (Weeping Myall Woodland). *A. pendula* occurs as a sub-canopy species in Bimble Box Woodland, whereas in Weeping Myall Woodland it is the characteristic canopy species. Further, the Bimble Box Woodland occurs on lower slopes, whereas the Weeping Myall Woodland is associated with alluvial flats.

Native Grassland

Native Grassland features native perennial tussock grasses including *Austrostipa* spp. and *Austrodanthonia* spp. as the tallest stratum. These areas are probably derived from historic clearing of woodland. Native Grassland only occurs in areas that do not feature recent soil disturbance or heavy vehicle traffic. There are occasional isolated remnant trees including *Eucalyptus microcarpa*, *E.populnea subsp. bimbil* and Belah (*Casuarina leuhmanii*). There is very little regrowth of these canopy species. The groundcover is dominated by Speargrass (*Austrostipa* scabra), Corkscrew Grass (*Austrostipa setacea*) and Wallaby Grass (*Austrodanthonia setaceae*). The groundcover also includes a sparse, patchy cover of native forbs including *Dichondra repens* and *Vittadenia cuneata* and exotic herbs including Dandelion (*Taraxacum officianale*) and Sowthistle (*Sonchus oleraceus*).

Native Grassland does not constitute a derived native grassland consistent with the definition for EPBC Box Gum Woodland and Derived Native Grassland due to a lack of native understorey species. It is derived from the TSC Act EECs Box-gum Woodland and/or Inland Grey Box Woodland and so would qualify as an EEC under the TSC Act (refer Section 5.1.4).

Modified or Disturbed Land

Much of the study area has been subjected to major disturbance through construction and mining activities associated with the existing Northparkes Mine and historical agricultural activities. Large areas of the S.75 modification areaare made up of bare earth, roads, laydown areas and pits that are subject to ongoing disturbance. These are largely free of vegetation and would have little capacity for native regeneration. Areas that do not feature ongoing disturbance, such as stockpiles and road verges are dominated by exotic species such as *Avena fatua*, *Lolium rigidum* and *Echium plantagineum*. These areas feature close to 100% cover abundance of exotic species and would also have very limited capacity for native regeneration. Areas in the west of the study area contain a crop of Wheat (*Triticum aestivum*). This area contains very little remnant vegetation with a few scattered *Eucalyptus* spp and *Callitris glaucophylla*. Margins of the Wheat crop feature exotic species such as *Avena fatua*, *Lolium rigidum*, *Echium plantagineum*, *Sisymbrium orientale* and *Brassica tournefortii*.

5.1.3 Threatened species

The desktop literature review indicates seven threatened plant species have been previously recorded, or are predicted to occur in the locality. None of these species was recorded within the study area despite suitable survey conditions (ie mid-Spring after recent rainfall). The majority of these species are considered unlikely to occur as they have limited ranges and/or habitat requirements, which are not present at the site. There is suitable habitat for three threatened plant species at the site:

- *Austrostipa wakoolica* (A Spear-grass)
- *Swainsona sericea* (Silky Swainson pea)
- *Swainson murrayana (*Slender Darling Pea*)*

Suitable habitat for these species is present in woodland and derived native grassland at the site. Although these species were not detected during field surveys threatened plants may colonise habitat at the site in the future or may exist in the soil seed bank or as dormant individuals. They are very unlikely to occur in disturbed land at the site due to historic removal and modification of the soil seed bank and ongoing competition from exotic species.

The full list of threatened plant species, including their habitat requirements and conservation status is presented in Table 13**.**

5.1.4 Endangered ecological communities

The desktop literature review indicates five EECs listed under the TSC/EPBC Acts which are known to occur in the Lower Slopes CMA Sub-Region. Three of these do not occur at the site. The remaining two EECs were recorded on site and are described in detail below and mapped in Figure 6.

The full list of EECs known from the region, including their habitat requirements and conservation status, is presented in Appendix C.

Box-gum Woodland

Yellow Box (*Eucalyptus melliodora*) is the dominant canopy species in a 1.14 ha patch of woodland at the site described as Yellow Box Woodland (see Section 5.1.2). Scattered Yellow Box also occur in association with other canopy trees either as isolated patches or adjacent to other vegetation types, but are not the dominant canopy species in these areas. Defining boundaries on areas containing scattered trees is difficult, particularly as this community is likely to have occurred within a mosaic of other vegetation types at the site and has been mostly cleared to create grazing land. DECC (and DEW (2006) determinations and guidelines outline citeria for identifying these EECs.

The following two tables set out the determination for Box-Gum Woodland under both the TSC Act (Table 4) and EPBC Act (Table 5). This community is also listed under Commonwealth legislation however; listing criteria differ slightly with greater emphasis at the federal level based on the composition and abundance of native groundcover species.

Table 4 NSW TSC Act criteria for the determination of Box Gum Woodland EEC

Criteria	Description	Does the site meet the criteria?
1	Does the site fall within the area defined in the NPWS Scientific Determination for Box Gum Woodland EEC?	Yes
2	Are characteristic trees White Box, Yellow Box or Blakely's Red Gum present (or likely to have been present) at the site?	Yes
3	Is the site mainly grassy?	Yes
4	Do any of the listed characteristic species occur?	Yes
5	If the site is degraded, is there potential for assisted regeneration of the overstorey or understorey?	N/A

Therefore Yellow Box Woodland within the s.75 modification area qualifies as the Box-Gum Woodland EEC under the NSW TSC Act. This community is also listed under Commonwealth legislation however; listing criteria differ slightly with greater emphasis at the federal level based on the composition and abundance of native groundcover species.

Table 5 Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (2006) criteria for assessing box Gum Woodland

Criteria	Description	Does the site meet the criteria?
1	Does the site contain or previously have contained White Box, Yellow Box or Blakely's Red Gum?	Yes
2	Does the site have a predominately native understorey?	Yes
3	Is the patch 0.1 ha or greater in size?	Yes
4	Are there 12 or more native understorey species present (excluding grasses)?	No
5	Is the site in "reasonable" condition? (i.e. At least one of the understorey species should be an important species (e.g. grazing-sensitive, regionally significant or uncommon species; such as Kangaroo Grass or orchids) in order to indicate a reasonable condition).	Yes
6	Where sites do not meet the criteria 4 and 5, is the	No

Criteria	Description	Does the site meet the criteria?
	patch 2 ha or greater in size?	
7	If yes, than does the patch have an average of 20 or more mature trees per hectare or is there natural regeneration of dominant overstorey Eucalypts?	No

The condition criteria outlined above are the minimum level at which patches are to be included in the listed ecological community. Yellow Box Woodland in the s.75 modification area does not meet these criteria. Although the woodland patch is more than 50 percent native groundcover species and contains at least three species listed as important under the EPBC Act list for White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland, it does not constitute this critically endangered ecological community. The native understorey contains only 10 native species (excluding chenopods such as *Enchylaena tomentosa* that are not on the community list for this EEC and are generally woody species not characteristic of this grassy woodlands). The patch also does not qualify on the criteria of patch size and numbers of mature canopy trees.

Based on these criteria, Yellow Box Woodland qualifies as EEC only under the TSC Act and not the EPBC Act.

The extent of Box-gum Woodland is shown on Figure 4.

The Corkery and Associates (2007) EA mapped areas of EPBC Act Grassy Box Woodland in the study area, including a portion in the north of the S.75 modification area. This area was sampled in the present survey and identified as Grey Box Woodland. There were no tree species diagnostic of this EEC (*Eucalyptus albens*, *E. blakelyi* or *E. melliodora*) in vegetation quadrats or areas random meandered for approximately 500m to the north of the S.75 modification area.

Inland Grey Box woodland

Inland Grey Box Woodland in the South West Slopes bioregion is listed as an EEC under the TSC Act. All areas mapped as Grey Box Woodland (Figure 4) within the proposed amendment area qualify as this EEC due to the presence of Grey Box (*Eucalyptus microcarpa*) as the dominant canopy species and a characteristic understorey of native grasses and herbs. Areas mapped as Bimble Box Woodland also qualify as Inland Grey Box Woodland since *Eucalyptus microcarpa* also occurs in the canopy through these areas. In Sivertson and Metcalfe (1995) vegetation mapping of the Forbes region they included vegetation types with both *E. microcarpa* and *E. populnea* subsp. *bimbil* in the canopy in the communities P3 (Open Box Woodlands) and P4 (Box Woodlands). Both of these communities are listed as consistent with Inland Grey Box woodland in the Scientific Committee Determination for the EEC (DECC, 2008d).

Native grassland at the site is a secondary or derived vegetation community. Its structure is probably a result of historic removal of trees rather than natural environmental factors. It occurs between stands of Yellow Box Woodland and Grey Box Woodland. Remnant trees and understorey species in the Native Grassland are characteristic of both woodland types and so it is not possible to determine with certainty which community would have occurred prior to clearing. For the purposes of this assessment it is assumed that this area would formerly have supported Grey Box Woodland, since this is the most prevalent woodland type in the vicinity.

The Scientific Committee Determination for Inland Grey Box Woodland states: "Some remnants of the community survive with trees partly or wholly removed". Further "Disturbed remnants are considered to form part of the community including remnants where the understorey, overstorey or both would, under appropriate management, respond to assisted natural regeneration from the soil seed bank" (DECC, 2008d).

Native Grassland at the site features a predominantly native understorey. Areas of intact woodland surround the patch and would contribute to potential overstorey regeneration through seed fall. It is also likely that overstorey species persist in the soil seed bank. Therefore it is likely that native grassland at the site would, through assisted natural regeneration, regenerate into a woodland consistent with the Inland Grey Box EEC. Therefore Native Grassland at the site qualifies as the TSC Act listed EEC ‘Inland Grey Box Woodland’.

5.1.5 Noxious Weeds

The *Noxious Weeds Act 1993* provides for the declaration of noxious weeds in local government areas. Landowners and occupiers must control noxious weeds according to the control category specified in the Act. Public authorities must control noxious weeds according to the control category to the extent necessary to prevent their spread to adjoining land.

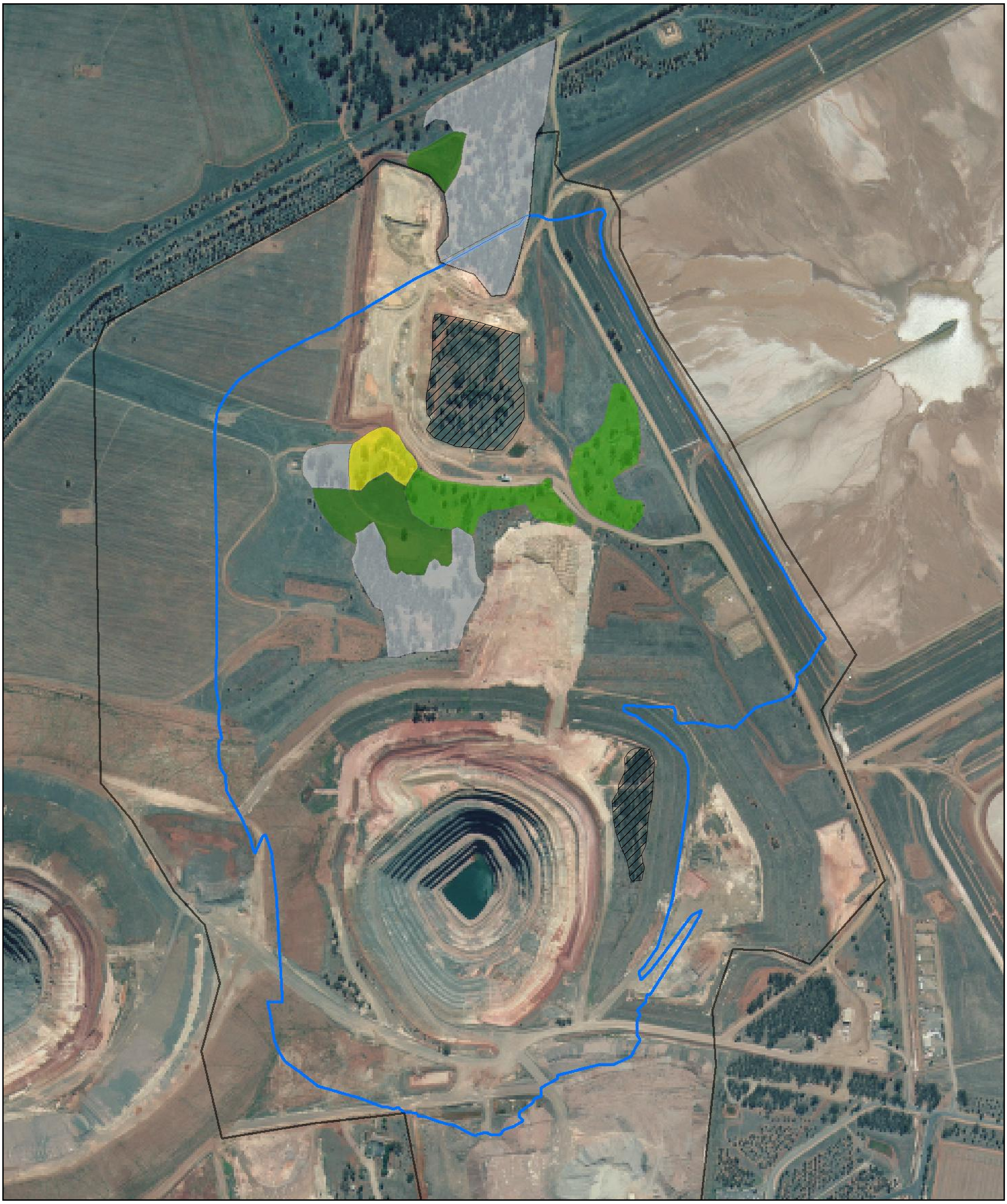
The site contains three species declared as noxious weeds in Parkes LGA as shown in Table 6 below. within the well-vegetated woodlands of the site noxious weeds were not common. These noxious species occurred at low numbers in disturbed areas of the site.

Table 6 Declared noxious weeds of the Parkes LGA recorded during the field survey.

Scientific Name	Common Name	Control category
Oxalis pes-caprae		5
Oxalis corniculata		5
Xanthium occidentale	Californian Burr	4

For Category 4: ‘the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority’. For Category 5: ‘the requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with’.

Pattersons Curse (*Echium plantagineum*) is widespread at the site. This species is not listed as noxious in Parkes LGA, however it is a serious environmental weed and is listed as noxious across the majority of NSW. It is recommended that *Echium plantagineum* continues to be managed within S.75 modification area according to the current site management practices and is accorded the same priority status as the noxious weeds listed above.



LEGEND

Vegetation Communities

- Grey Box Woodland (TSC Act EEC)
- Yellow Box Woodland (TSC Act EEC)
- Bimble Box Woodland (TSC Act EEC)
- Native Grassland
- Disturbed / Cleared Land
- Disturbance Area
- Existing Approved Disturbance

1:7,000 (at A3)

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

CLIENTS | PEOPLE | PERFORMANCE

NorthParkes Mines
Section 75W Modification for NPM

Job Number	21-17903
Revision	A
Date	18 DEC 2008

Vegetation Communities

Figure 4

G:\21\17903\CADD\GIS\MapDocument\Z005_VegetationCommunities.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON

5.2 Fauna

5.2.1 Fauna species

The GHD October 2008 field surveys recorded a moderate diversity of native fauna at the site including 13 mammals, 44 species of bird, five frogs and two reptiles as listed in Table 12 of Appendix B**.**

Birds

One threatened bird species, the TSC Act listed Grey-crowned Babbler (*Pomastomus temporalis temporalis*) was recorded at the site. There is a moderate diversity of native birds at the site, however the species observed are from a limited of guilds (ie species with different niches or lifestyles). The limited range of guilds suggests that habitat resources important for many native birds are absent from the site (Keast et al, 1985). Guilds and species observed included:

- large, communal woodland birds such as the Apostlebird (*Struthidea cinerea*) and White winged Chough (*Corcorax melanorhamphos*);
- open country species such as the Australian Magpie (*Gymnorhina tibicen*) and Australian Raven (*Corvus coronoides*),
- wetland birds including Pacific Black Duck (*Anas superciliosa*), White-necked Heron (*Ardea pacifica*) and Masked Lapwing (*Vanella miles)* ;
- parrots common in agricultural landscapes such as the Galah (*Eolophus roseicapillus*), Eastern Rosella (*Platycercus adscitus eximius*) and Blue Bonnet (*Northiella haematogaster*);
- raptors including the Nankeen Kestrel (*Falco cenchroides*) and Black-shouldered Kite (*Elanus axillaris*); and
- the nocturnal, predatory species Tawny Frogmouth (*Podargus strigoides*) and Barn Owl (*Tyto alba*).

Honeyeaters and smaller woodland birds were virtually absent from the site. This probably reflects the small patch sizes of native vegetation and the lack of small tree and shrub layers (refer Section 5.1.2).

Grey-crowned Babblers were recorded repeatedly through the survey period suggesting that the home range of a family group includes portions of the site. Grey-crowned Babblers were observed most frequently in Grey Box Woodland in the north of the site. A dome-shaped nest typical of the species was observed in this patch. This patch is the largest area of remnant vegetation at the site and has good connectivity to a larger patch to the north and road corridor vegetation to the east and west. Based on these attributes this patch is likely to be the most important habitat for the species in the site. The Grey-crowned Babbler is a relatively weak flier and it has been reported that they are reluctant to cross large clearings (DECC, 2008b). Grey-crowned Babblers were also observed foraging and sheltering in other woodland patches at the site, suggesting that smaller remnants also have value for the species. This suggests that the species is able to traverse existing haul roads and other clearings and that remnant woodland patches within the site are a locally important habitat network for the Grey-crowned Babbler.

Mammals

A moderate abundance of native mammals were observed during field surveys including the Eastern Grey Kangaroo (*Macropus giganteus*), Common Brushtail Possum (*Trichosurus vulpecular*) and Swamp Wallaby (*Wallabia bicolor*). Eastern Grey Kangaroos are abundant at the site, across both native and exotic vegetation, with mobs of up to 20 individuals frequently observed through the field surveys. Swamp Wallaby and Brushtail Possum are less common and appeared to be confined to patches of woodland.

A Glider (*Petaurus* sp.) was observed by spotlight in Grey Box Woodland in the north of the study area. This genus is difficult to identify to species level by spotlight and so it is not possible to determine if it was a Sugar Glider (*Petaurus breviceps*) or the *TSC Ac*t listed Squirrel Glider (*Petaurus norfolkensis*). There are records of both the Sugar Glider and the Squirrel Glider in the Goobang National Park 30 kilometres to the west and also along the Lachlan River to the south (DECC, 2008).

Three common exotic species were observed within the study area, the Fox *(Vulpes vulpes*), Brown Hare (*Lepus capensis*) and Rabbit (*Oryctolagus cuniculus*).

GHD ecologists observed 12 microchiropteran bats during the stagwatch period on 14 October 2008. Two Anabat detectors were set for two nights from dawn to dusk.. Five species of microbat were identified as 'definite' records at the site: Little Forest Bat (*Vespadelus vulturnus*), Gould's Wattle Bat (*Chalinolobus gouldii*), a Freetail Bat (Mormopterus sp4), White-striped Freetail Bat (*Tadarida australis*) and the Little Broadnosed Bat (*Scotorepens greyii*). A further species, the Inland Broad-nosed Bat (*Scotorepens balstoni*) was identified as probable during the survey period. The below table (Table 7) summarises the Anabat results.

Table 7. Microchiropteran bat species detected by Anabat recorder, over a two-night survey period.

Species	**Anabat A**	**Anabat B**	**Anabat A**	**Anabat B**
	13/10/08	13/10/08	14/10/08	14/10/08
Mormopterus Sp. 4 (Adams et al 1988)	Definite	Probable		Definite
Tadarida australis	Definite	Definite	Definite	
Vespadelus vulturnus	Definite	Probable	Possible	Probable
Scotorepens greyii	Probable	Probable		
Chalinolobus gouldii	Probable	Definite	Probable	Possible
Scotorepens balstoni		Probable	Probable	Definite
C. gouldii or *Scotorepens balstoni*	Possible			

All of the species recorded are common and widespread in the region. Some of the "possible" calls recorded at the site were in a frequency range that could potentially indicate one or more threatened species of microbat. However these species are not known from Parkes LGA and so it is more likely that these uncertain calls belong to *Vespadelus vulturnus.* Threatened species that were considered for the Parkes area are the Yellow-bellied Sheathtail bat (*Saccolaimus flaviventris)* and Eastern Long-eared Bat (*Nyctophilus timoriensis);* none of the calls recorded could be attributed to either of these species (Williams, R. pers. comm.).

Reptiles and frogs

A limited number and diversity of reptiles were recorded at the site, probably due to the mild and rainy weather experienced during field surveys. Only two species Bearded Dragon (*Pogona barbata)* and Garden Sunskink (*Lampropholis guichenoti*) were observed.

A moderate diversity and high abundance of native frogs are present at the site. The Spotted Grass Frog (*Limnodynastes tasmaniensis),* Beeping Toadlet *(Crinia parainsignifera)* Peron's Tree Frog *(Litoria peronii)* and the Broad-palmed Frog *(Litoria latopalmata)* were abundant and calling in dams, sediment traps and drains. The Desert Tree Frog (*Litoria rubella)* was also observed sheltering in woodland.

5.2.2 Fauna habitats

Habitat assessments were conducted across the entire study area in order to determine the conservation significance of fauna habitats and to assess the potential presence of native fauna (and especially threatened species) not directly observed during the surveys.

Habitat features and resources are described in terms of the native fauna they may support with specific reference to threatened species previously recorded in the study area. Important habitat resources are mapped on Figure 5**.**

The habitat assessment identified the following main habitat types across the study area:

Woodland

Yellow Box Woodland, Grey Box Woodland and Bimble Box Woodland at the site are likely to have equivalent habitat value for native fauna and so are assessed together.

Woodland at the site is in moderate condition to poor condition. It contains healthy, mature trees forming a canopy with a woodland or open woodland structure (Specht, 1980) equivalent to undisturbed examples of these vegetation communities (Sivertson and Metcalfe, 1995). Woodland at the site contains good quantities of hollow bearing trees and stags and moderate recruitment of juveniles and seedlings. Based on these structural attributes woodland at the site would be expected to support a moderate diversity of native birds, microbats and arboreal mammals. However the woodland occurs as relatively small patches surrounded by extensive cleared areas. These disturbed areas, especially active haul roads and deep open cut pits, would constitute a barrier to many native fauna species. As a result woodland at the site is only likely to support more mobile and adaptable fauna species able to traverse cleared areas and tolerate disturbance. These include species like the Eastern Grey Kangaroo, Apostlebird and Noisy Miner which were abundant during field surveys and are common and widespread in agricultural landscapes of Central NSW. Woodland may also support more mobile threatened species such as Grey-crowned Babbler and Superb Parrot (*Polytelis swansonii*). Woodland patches at the site are unlikely to support local populations of species, which require large tracts of intact habitat such as the Speckled Warbler (*Pyrrholaemus saggitatus*) and Hooded Robin (*Melanodryas cucullata*).

Eucalyptus melliodora, E. microcarpa and *E. populneas* are nectar and seed-bearing and would provide a food resource for native fauna, including the Superb Parrot, Turquoise Parrot (*Neophema pulchella*) and arboreal mammals. *E. melliodora* is autumn and winter-flowering and may provide seasonal nectar resources for migratory species including the Swift Parrot (*Lathamus discolour*), Regent Honeyeater (*Xanthomyza phrygia)*, Painted Honeyeater (*Grantiella picta*) and Black-chinned honeyeater (*Melithreptus gularis gularis*).

Small trees and shrubs are important for many woodland bird species and arboreal mammals such as the Sugar Glider and Squirrel Glider. These vegetation layers provide shelter and foraging resources such as nectar and sap. Small trees and shrubs are sparse to absent in woodland at the site, apart from a localised stand of *Acacia pendula* in the central portion of the site. This patch is unlikely to support Gliders nor woodland birds as it is isolated by surrounding haul roads and excavations. Intact woodland and visual screening plantings to the north of the site provide more valuable habitat resources for these species. The single Glider species observed during field surveys was noted in woodland in the far north of the site (refer Figure 6). Local populations are unlikely to use woodland farther south in the proposed disturbance area.

Casuarina leuhmanii (Belah) is only present as a few isolated trees at the site and would not provide sufficient food resources to support local populations of the Glossy Black Cockatoo (*Calyptorhynchus lathami)*. The species is known to frequent preferred feed trees which are mature, healthy, in dense stands and bear good quantities of fruit (DECC, 2008_{b}).

The S.75 modification area contains one Koala Feed Tree species listed on Schedule 2 of SEPP 44, namely Bimble Box (*Eucalyptus populnea*). Bimble Box comprised close to 100% of the canopy cover in areas mapped as Bimble Box Woodland and over 15% of the total number of trees in the upper or lower strata of the tree component within the woodland areas as a whole. As such the S.75 modification area constitutes “potential Koala habitat” within the meaning of SEPP 44. No evidence of Koalas was recorded in the field surveys. There is no evidence that the site supports a local population of Koala, including breeding females, therefore the site does not constitute “core Koala habitat”. Therefore no further assessment under SEPP 44 is required for the s.75 modification. Nonetheless, the site contains potential habitat for the Koala and so potential impacts on the species with respect to the requirements of the EP&A Act are assessed below.

There are good quantities of hollow-bearing trees in woodland at the site. Large, important habitat trees are plotted on Figure 5 and discussed in greater detail below.

The understorey is in moderate condition with good cover of native tussock grasses and herbs. Native grasses provide a superior food resource to exotic pasture for many native birds including threatened species such as Diamond Firetail (*Stagonopleura guttata*) and Turquoise Parrot (*Neophema pulchella*).

Native Grassland

Native Grassland at the site has the potential to provide important foraging habitat for many native bird species, particularly finches and parrots. This community is dominated by native, perennial tussock grasses, which are an important food resource for species such as the Diamond Firetail and Turquoise Parrot. This community is surrounded by intact woodland and is likely to provide additional foraging habitat woodland birds.

Disturbed land

Clear areas such as haul roads and laydown areas contain extremely limited resources for both native and exotic animals. There is virtually no natural shelter such as rock fragments or woody debris and very patchy vegetation cover. Accordingly these areas are only likely to support opportunistic species. These may include native bird species such as Australian Magpie and Australian Magpie-lark and exotic fauna such as European Rabbit and Red Fox.

Areas with denser vegetation cover are dominated by exotic species. Vegetation cover is dominated by unpalatable species such as Pattersons Curse (*Echium plantagineum*) and Thistles and Burrs (Asteraceae spp.). These would provide shelter and limited foraging resources for native fauna but are most likely to be utilised by common generalists such as the Eastern Grey Kangaroo, Noisy Miner and Australian Raven. Some threatened species such as the Superb Parrot and Major Mitchells Cockatoo (*Cacatua leadbeateri*) are known to forage on exotic species however these resources are abundant in surrounding landscapes and would have limited value for local populations of these species.

Aquatic and wetland habitat

The site features large areas of aquatic and wetland habitat including drains, retention ponds, ephemeral marshes and farm dams (refer Figure 5). Larger dams and ponds provide nocturnal refuge and foraging habitat for waterfowl including the Pacific Black Duck (*Anas superciliosa*), Grey Teal (*Anas gracilis*) and Australian Grebe (*Tachybaptus novaehollandiae*) observed during field surveys. They have limited cover of aquatic and semi-aquatic vegetation and are surrounded by cleared land. Accordingly they are unlikely to support shelter-dependant wetland birds such as Australian Painted Snipe (*Rostratula australis*) and Australasian Bittern (*Botaurus poiciloptilus*). Dams and ponds at the site are also unlikely to support the open water species Blue-billed Duck (*Oxyura australis*) and Freckled Duck (*Stictonetta naevosa*) as they prefer large, permanent wetlands with dense fringing vegetation (DECC, 2008).

Shallower drains and marshes feature dense cover of *Typha orientalis* and other semi-aquatic plants. They provide good foraging habitat for native wetland birds including the White-necked Heron, Masked Lapwing and Black-winged Stilt (*Himantopus himantopus*) observed on site. They may provide foraging habitat for the Australian Painted Snipe and Australasian Bittern though the surrounding disturbed areas and ongoing mining activities would limit their value. These wetlands support large breeding populations of frogs and would also support native invertebrates and reptiles.

Dams would provide foraging habitat for microbats potentially including the threatened Yellow-bellied Sheathtail bat and Eastern Long-eared Bat.

These wetlands are a product of surface disturbance associated with mining activities and therefore are not consistent with the EEC "The aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River" (Lachlan River EEC)(DPI, 2008). These habitats are isolated from natural aquatic habitats outside the site. Therefore the site would not support a natural ecological community and would not provide habitat for threatened fish as there is no opportunity for recruitment. They would support an aquatic community limited to species which are amphibious at some point in their life cycle (i.e. species which are able to traverse dry land to reach aquatic habitat). These species would include native macroinvertebrates, frogs, reptiles and crustaceans but not fish or molluscs.

Goonumbla Creek, adjacent to the proposed crusher locations, is a natural drainage line. It is a small, channel confined ephemeral creek. It would only carry surface water after very heavy rainfall events (Metcalfe, G. pers. comm.). It is surrounded by extensively modified agricultural landscapes and does not contain any discernible aquatic habitat or riparian vegetation. Vegetation within the stream bed and banks is probably dominated by exotic grasses. It is hydrologically connected to the Bogan River, to the south west of NPM, however habitat connectivity would be very poor given that Goonumbla Creek is generally dry and does not contain refuges such as pools, woody debris or riparian vegetation. It is unlikely to comprise important additional habitat for aquatic ecosystems outside the study area. It is unlikely that Goonumbla Creek would support local populations of any fish, aquatic invertebrates or other aquatic fauna and so it would not qualify as the Lachlan River EEC (DPI, 2008).

Other habitat resources

The DEC (2004) guidelines identify "special habitats" (eg water bodies, rocky outcrops and cliffs) that are likely to support specific fauna assemblages. These resources may be significant for threatened species (DECC, 2008). Tree hollows are important for native fauna as diurnal or nocturnal shelter sites, for rearing young, for feeding, for thermoregulation, and to facilitate ranging behaviour and dispersal. An estimated 15% of all terrestrial vertebrate fauna in Australia are dependent upon tree hollows and for many of these species the relationship is obligate i.e. no other habitat resource represents an adequate substitute (Gibbons and Lindenmayer, 2002). Accordingly the field survey included a targeted survey of specific habitat resources in addition to the assessment of the communities described above.

Woodland in the study area is mature and contains approximately 65 hollow-bearing trees and stags (refer Figure 5) including 45 within the proposed disturbance area. Ground-based field surveys may underestimate the quantity of important tree hollows present in a vegetation community. Conversely, many hollows visible from the ground may not have the required depth, orientation or other attributes required to constitute suitable shelter (Gibbons and Lindenmayer, 2002). Therefore the above assessment should be considered an estimate of the quality and quantity of tree hollows on site. Overall the study area is likely to contain sufficient quantities of these resources to support local populations of hollow-dependant fauna.

Hollow-bearing trees may provide suitable diurnal roost sites for tree-roosting microbats including the threatened Eastern Freetail Bat and Yellow-bellied Sheathtail Bat. They are also likely to support native parrots including the Red-rumped Parrot and Galah observed nesting during the field surveys and potentially also threatened species such as the Major Mitchells Cockatoo and Turquoise Parrot. The Superb Parrot is known to occur in the immediate vicinity of the site (GHD, 2007). The closest known breeding population is approximately 100 km to the south of the site (Webster, 1988; DECC, 2008b). However, the GHD (2007) observation included a single fledgling, which may indicate a breeding population closer to the site and potential use of hollows at the site for breeding. The status of the Superb Parrot population in the locality is discussed further in Section 5.2.3 below.

The site contains reasonable amounts of standing and fallen dead timber, which would provide shelter and foraging resources for native invertebrates, reptiles and small terrestrial mammals.

There were no natural rock outcrops or cliff lines in the survey area. Excavations within the s.75 modification area featured shallow clayey sides and did not contain fissures, caves or overhangs large or sheltered enough to provide suitable sites for maternity colonies or diurnal roost sites for microbats. Underground cave workings in the vicinity of the site may provide habitat for cave-roosting microbats however these were not surveyed directly.

Patch Sizes and Connectivity

The northernmost patch of Grey Box Woodland in the study area is large (see Figure 4) and has good connectivity with native vegetation to the north and with road corridors to the east and west. It would support healthy local populations of a range of native birds, mammals and reptiles including less mobile and patch-size dependant species.

The remainder of woodland at the site comprises smaller patches isolated by surrounding roads and excavations and would support open country bird species and a limited suite of native reptiles and mammals. The construction footprint for the s.75 modification area is located almost entirely within the existing operational area of the NPM site. This habitat is relatively isolated in a regional context. This lack of connectivity would restrict the movement of native reptiles, arboreal mammals and small terrestrial mammals. Land to the north and west of the site feature a matrix of patchy open woodland and cleared agricultural land. Areas to the east and south contain existing mine infrastructure.

Edge effects are likely to reduce the value of habitat remnants at the site, allowing feral predators and introduced flora species to intrude into native vegetation. Dust, altered hydrology and altered nutrient flows associated with the operating mine are also likely to reduce the value of habitat at the site.

5.2.3 Threatened fauna species

One threatened bird species was observed during GHD October 2008 field surveys: the TSC Act listed Vulnerable Grey-crowned Babbler. Grey-crowned Babbler records are shown on Figure 6, however all woodland vegetation at the site would comprise habitat for local populations of the species.

One Glider (*Petaurus* sp.) was observed during spotlight surveys. As described above this genus is difficult to identify to species level by spotlight and may have been the Squirrel Glider (*Petaurus norfolcensis*), which is listed as vulnerable under the TSC Act. Based on the application of the precautionary principal this assessment assumes that this individual was a Squirrel Glider and that the site contains habitat for the species.

The Superb Parrot was observed utilising woodland within the Limestone National Forest and nearby areas of NPM during December 2007 pre-clearing surveys (GHD, unpub.a) . A newly fledged chick (2007 nesting season) was observed in woodland adjacent to the operating portion of the mine. Superb Parrots were observed on a number of occasions flying over the subject site from the Limestone National Forest in a north westerly direction. Groups of as many as 15 individuals were observed on one occasion with groups averaging approximately six individuals. These records confirm that a local population of Superb Parrot occupies the study area, at least seasonally. Breeding sites for the TSC/EPBC Act listed Superb Parrot have considerable conservation significance (DECC, 2008b; DEH, 2008; Webster, 1988) and so it is important to resolve whether this population breeds at or in the vicinity of the site. The following information is available:

» The closest known breeding population is approximately 100 km to the south of the site and is known as the south west slopes population (Webster, 1988; DECC, 2008b).

» The south west slopes breeding population nests in Box woodlands, typically in hollow-bearing White Box (*Eucalyptus albens)* in close proximity to water and suitable foraging habitat in nearby large stands of Box woodland (Webster, 1988).

» The south west slopes breeding population is known to breed between September and early December and then disperse with young into foraging habitat. This explains their historic absence from northern parts of their range during the Spring-Summer breeding season (Webster, 1988; DECC, 2008b). However in recent years Superb Parrots have been observed year round in some northern locations (Webster, R. pers. comm.) including the Parkes region (Schrader, N. pers. comm.).

» A previously unidentified breeding population of the Superb Parrot may occur in the Parkes region, most likely in the vicinity of the Lachlan River and/or Bogan River (Webster, R.; Schrader, N. pers. comms.).

» A fledgling Superb Parrot and up to 15 adults were observed at the NPM site during field surveys conducted between 10-14 December 2007 (GHD, unpub. a);

» No Superb Parrots were observed at or in the vicinity of the site during the GHD September (2008) pre clearing survey (GHD, unpub.b). This survey incorporated careful scanning of potential roost trees and hollows in a patch of Box woodland in the centre of the current s.75 modification area('Annas Island' on refer Figure 4); and

» No Superb Parrots were observed at or in the vicinity of the site during the GHD October (2008) field survey. This survey incorporated careful scanning of potential roost trees and hollows within all remnant vegetation at the site.

It is very unlikely that if a local breeding population of the species occurred at, or in the vicinity of the site that GHD (unpub.b) and the current field surveys during the September to December breeding season would not have detected them. Therefore, based on the above considerations the site is not likely to support a local breeding population of the Superb Parrot. It is most likely that the GHD (unpub.a) 2007 observation of a fledgling Superb Parrot was of an individual that was born in breeding habitat elsewhere in the region and subsequently dispersed to occupy foraging habitat at the site. This population would exploit foraging resources at the site on a transient basis. Therefore the site contains foraging habitat (but is unlikely to provide breeding habitat) for the Superb Parrot.

The GHD September 2008 pre-clearing survey of Anna's Island, within the surface disturbance area for the proposed activity, recorded mainly common and widespread species. A nest typical of the Grey-crowned babbler was observed, however no individuals of the species were directly recorded (GHD, unpub.b).

The Corkery and Co (2006) Environmental Assessment recorded the Yellow-bellied Sheathtail-bat within the S.75 modification area. This species forages in *Eucalyptus* forests and woodlands and adjacent grasslands. It has very broad diurnal roost requirements and will shelter in tree hollows, crevices, caves, culverts, buildings and even animal burrows (DECC, 2008b). Native vegetation at the site provides foraging and roosting habitat for the Yellow-bellied Sheathtail-bat . Corkery and Co (2006) also recorded the Grey-crowned Babbler and the Superb Parrot approximately 3km from the S.75 modification area.

The desktop review indicates the potential presence of a further 26 threatened fauna species listed under the TSC Act, as Wildlife Atlas records in the locality (refer Figure 7), and/or the EPBC Act and predicted to occur in the local area. The full list of threatened fauna, including their conservation status, habitat requirements, previous records and likelihood of occurrence is presented in Appendix C**.** A review of the specific habitat requirements of these species, and the habitat present within the study area allowed a number of these species to be eliminated as having a low likelihood of occurrence at the site.

A total of 18 species were considered a medium likelihood of occurrence at the site based on the presence of suitable foraging and roosting habitat at the site. There is no evidence, such as recent records in the locality or specific important habitat resources that suggests the S.75 modification area supports permanent local populations of any of these species. However these fauna species may occur in habitat at the site on an occasional or opportunistic basis. Threatened fauna species that may utilise habitat at the site are presented below:

- *Burhinus grallarius* Bush Stone-curlew
- *Grus rubicunda* Brolga
- *Falco hypoleucos* Grey Falcon
- *Lophoictinia isura* Square-tailed Kite
- *Lathamus discolor* Swift Parrot
- *Neophema pulchella* Turquoise Parrot
- *Cacatua leadbeateri* Pink Cockatoo
- *Ninox connivens* Barking Owl
- *Climacteris picumnus* Brown Treecreeper
- *Pyrrholaemus saggitatus* Speckled Warbler
- *Xanthomyza phrygia* Regent Honeyeater
- *Grantiella picta* Painted Honeyeater
- *Melithreptus gularis gularis* Black-chinned honeyeater (eastern sub-species)
- *Melanodryas cucullata* Hooded Robin
- *Stagonopleura guttata* Diamond Firetail
- *Dasyurus maculatus* Spotted-tailed Quoll
- *Phascolarctos cinereus* Koala
- *Pteropus poliocephalus* Grey-headed Flying-fox
- *Chalinolobus picatus* Little Pied Bat
- *Nyctophilus timoriensis* Eastern Long-eared Bat

LEGEND

Habitat Feature or Observation

- Aquatic Habitat
- Fallen Timber
- Habitat Tree
- Nest / Roost

Disturbance Area

'Anna's Island', Cleared September 2008

1:6,000 (at A3)

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

CLIENTS | PEOPLE | PERFORMANCE

NORTHPARKES

NorthParkes Mines
Section 75W Modification for NPM

Job Number	21-17903
Revision	A
Date	13 NOV 2008

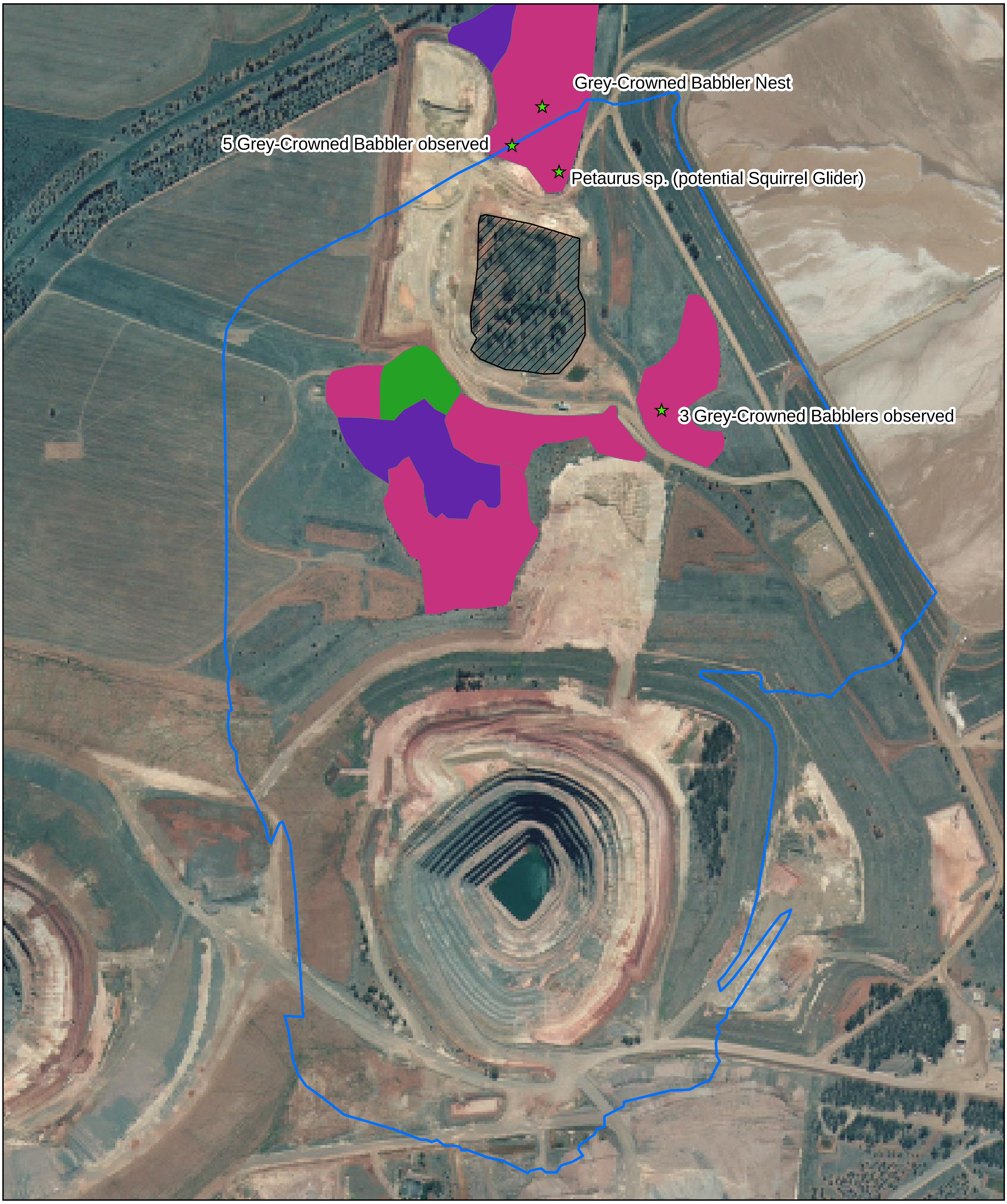
Habitat Features and Resources

Figure 5

G:\21\17903\CADD\GIS\MapDocument\Z006_HabitatFeatures&Resources.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON



LEGEND

★	Threatened Fauna Species		Inland Grey Box Woodland (TSC Act EEC)
	'Anna's Island', Cleared September 2008		Box Woodland Derived Native Grassland (TSC Act EEC)
	Disturbance Area		Box-gum Woodland (TSC Act EEC)

1:6,000 (at A3)

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

GHD

CLIENTS | PEOPLE | PERFORMANCE

NORTHPARKES

NorthParkes Mines
Section 75W Modification for NPM

Job Number 21-17903
Revision A
Date 18 DEC 2008

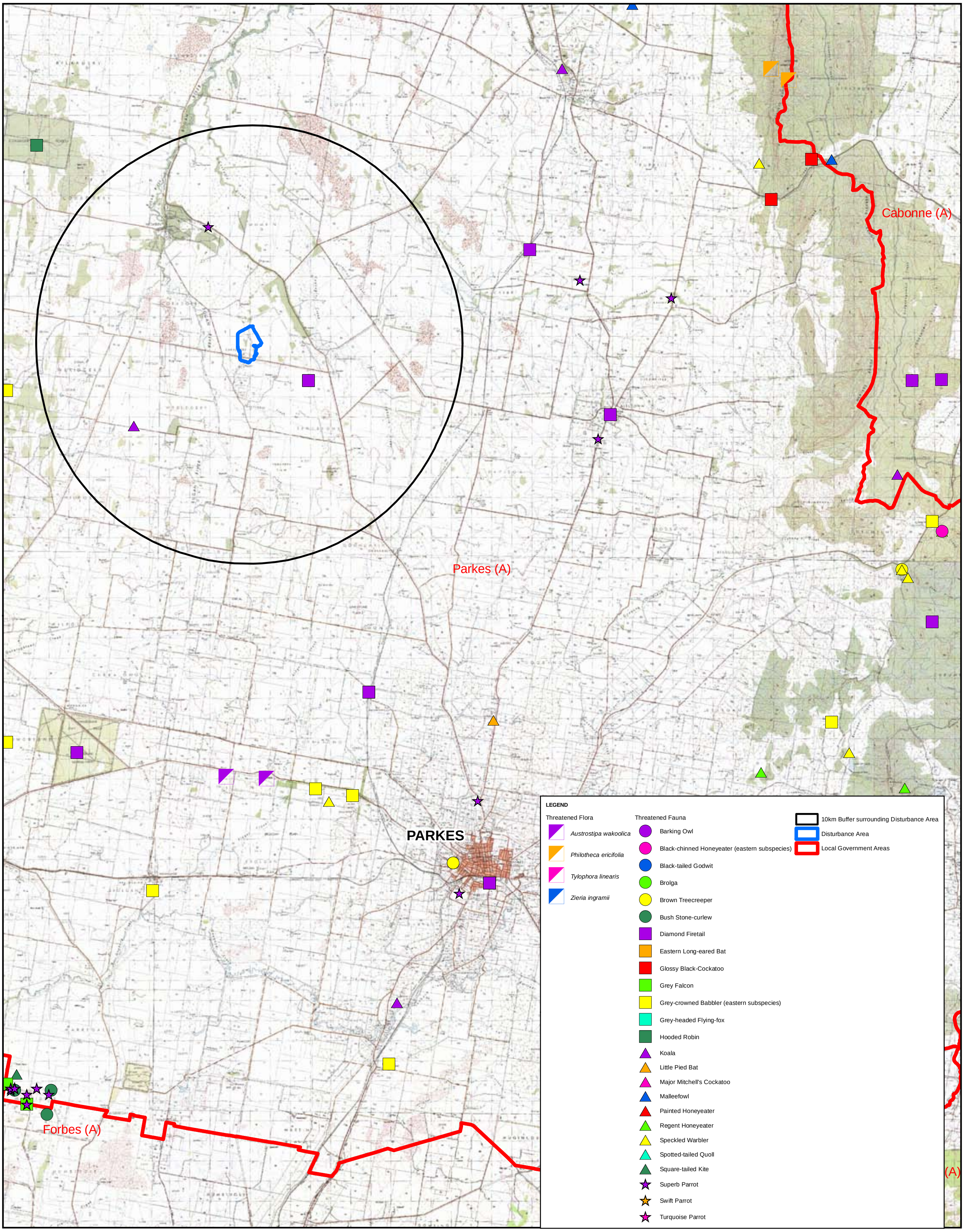
Conservation Significance

Figure 6

G:\21\17903\CADD\GIS\MapDocument\Z007_ConservationSignificance.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON



1:250,000 (at A4)

0 1,000 2,000 4,000 6,000 8,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

GHD
CLIENTS | PEOPLE | PERFORMANCE

NORTHPARKES

NorthParkes Mines
Section 75W Modification for NPM

Threatened Flora
and Fauna Species

Job Number	21-17903
Revision	A
Date	13 NOV 2008

Figure 7

G:\21\17903\CADD\GIS\MapDocument\Z008b_ThreatenedSpecies.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007; NSW Department of Environment and Climate Change: Atlas of NSW Wildlife - 2008. Created by: RCJOHNSON

5.3 Threatening processes

A ‘key threatening process’ is defined under the *TSC Act* as ‘a threatening process specified in Schedule 3’ of the Act. A ‘threatening process’ is defined as ’a process that threatens, or may have the capability to threaten the survival or evolutionary development of species, populations or ecological communities’.

There is direct evidence of the following key threatening processes (KTPs) currently operating at the S.75 modification area:

» Predation by the European Red Fox; and

» Competition and grazing by the feral European Rabbit

The following processes would have operated previously, given the modified landscapes and vegetation communities present at the site:

» Clearing of native vegetation;

» Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands

» Invasion of native plant communities by exotic perennial grasses;

» Loss of Hollow-bearing Trees; and

» Removal of dead wood and dead trees.

The proposed activity will directly contribute to the operation of three KTPs:

» Clearing of native vegetation;

» Loss of Hollow-bearing Trees; and

» Removal of dead wood and dead trees.

The extent and severity of the operation of these processes is described in Section 6.6.

6. Impact Evaluation

This Section assesses the potential impacts of the proposal during construction and operation on the flora and fauna of the study area.

6.1 Assessment of Significance of Impacts

6.1.1 Threatened Flora Species

The proposed development will not directly impact any known populations of threatened flora species. It will remove potential habitat for three threatened flora species that are known or predicted to occur in the study area:

» *Austrostipa wakoolica* (A Spear-grass);

» *Swainsona sericea* (Silky Swainson pea); and

» *Swainson murrayana (*Slender Darling Pea*).*

Suitable habitat for these species is present in woodland and derived native grassland at the site.

An evaluation of the magnitude, extent and significance of impacts of the proposal on these threatened flora species and their habitats following the assessment criteria identified in the Guidelines for Threatened Species Assessment under Part 3A of the EP & A Act (DEC 2005 and DPI 2005) has been undertaken and is provided in Appendix D. The outcome of this assessment is that the proposed development is unlikely to impose a significant adverse impact on threatened flora species of state or national conservation significance or their habitats.

6.1.2 Threatened Fauna Species

Grey-crowned Babbler

The proposed activity would involve the clearing of approximately 14 ha of habitat for the Grey-crowned Babbler. The results of the GHD (2008) field surveys suggest that this area falls within the territory of a local family group of Grey-crowned Babblers. An evaluation of the magnitude, extent and significance of impacts of the proposal on local populations of these species and their habitats following the assessment criteria identified in DEC/DPI (2005) guidelines has been undertaken and is provided in Appendix D.

The total size of this territory and the relative importance of the 14.3 ha to be removed is unclear. The DECC (2008b) profile for the species notes: “territories range from one to fifty hectares (usually around ten hectares)”. Grey-crowned Babblers were observed both within and outside the proposed surface disturbance area and so it is unlikely that the local territory falls entirely within the site. Nonetheless, based on the DECC (2008b) estimates the proposed activity would remove a minimum of 30% of the habitat likely to fall within this territory. It is not possible to say with certainty that sufficient alternative habitat exists in the local area. Therefore the outcome of the assessment of significance pursuant to the DEC/DPI (2005) guidelines is that it is likely that the proposed activity will have a significant negative effect on the local population of the Grey-crowned Babbler.

Superb Parrot

The proposed activity would involve the clearing of approximately 14.3 ha of foraging habitat for the Superb Parrot. There is not sufficient information currently to determine whether the site represents a temporary foraging habitat or regular seasonal foraging ‘stepping stone’ habitat linking important resources. The Superb

Parrot traverses large distances to exploit seasonal foraging resources and so it is unlikely that the proposed activity will have a significant negative effect on the local, seasonal population of the Superb Parrot. Therefore the outcome of the assessment of significance pursuant to the DEC/DPI (2005) guidelines is that the proposed development is unlikely to impose a significant adverse impact on local populations of the Superb Parrot.

Yellow-bellied Sheath-tail Bat

The proposed activity would involve the clearing of approximately 14.3 ha of foraging habitat for Yellow-bellied Sheathtail Bat . The proposal will also remove 45 hollow bearing trees which may provide important diurnal roost sites and while unlikely may also provide potential maternity colony sites for the species. Much of the native vegetation in the study area is immature regrowth or visual screening plantings. These areas do not contain mature trees and would not provide alternative breeding or sheltered roosting resources for the species, however, these areas are likely to represent foraging habitat for this fast and high flying species. The outcome of the assessment of significance pursuant to the DEC/DPI (2005) guidelines is that the proposed activity is not likely to have a significant effect on local populations of the Yellow-bellied Sheathtail Bat.

Other Mobile Threatened Fauna

The proposed activity will remove potential habitat for a further 20 threatened fauna species which were identified as possibly occurring within the study area, and may utilise habitat at the site, at least on occasion or on an opportunistic basis. An evaluation of the magnitude, extent and significance of impacts of the proposal on local populations of these species and their habitats following the assessment criteria identified in DEC (2005) and DPI (2005) guidelines has been undertaken, based on a general consideration of the likelihood of impacts on these species. The proposed development is unlikely to impose a significant adverse impact on any other threatened fauna species or their habitats based on the following considerations:

- None of the above listed threatened fauna species have previously been recorded at or in the vicinity of the site and there are no specific habitat features or resources at the site that suggest any permanent local populations are present;
- There is no evidence of important breeding, roosting or sheltering habitat for any of these species at the site;
- The proposal would have a minor affect on migration and dispersal ability as the habitat to be removed is at the southern extreme of a patch of habitat and is a ‘dead end’, with fauna movement interrupted to the south, east and west by the existing mine; and
- The 14.3 ha of native vegetation to be removed is likely to make a minor overall contribution to the amount of potential habitat available to these species, especially given the isolated nature of the habitat to be cleared, and ongoing degradation by weed invasion and surrounding mining activities.

6.1.3 Endangered Ecological Communities

Two endangered ecological communities (EECs) listed under the TSC Act are present within the S.75 modification area:

- White Gum, Yellow Box, Blakely’s Red Gum Woodland (Box-gum Woodland); and
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Inland Grey Box Woodland).

Areas of Native Grassland at the site also qualify as Inland Grey Box Woodland for the purposes of this assessment.

The Project will involve direct clearing of these EECs (refer Section 6.2 below). The Project may also have negative impacts on these communities outside the construction footprint by interfering with natural surface and groundwater flow regimes and increasing and creating new edges and thus the risk of weed infestation. An assessment of impacts associated with the s.75 modification on EECs has been undertaken (refer Appendix D). The outcome is that the proposed activity is unlikely to result in a significant impact on local populations of these communities based on the following considerations:

- A maximum of 1.15 ha of Box-gum Woodland would be cleared;
- A maximum of 9.75 ha of Inland Grey Box Woodland would be cleared;
- A maximum of 2.68 ha of Native Grassland (comprising a degraded form of Inland Grey Box Woodland) would be cleared; and
- The majority of woodland to be cleared occurs as fragmented patches and are subject to ongoing disturbance from mining activities and weed invasion. These patches would provide a minor contribution to the viability of woodland in the locality and the region.

6.1.4 Critical habitat

There is no recommended or declared critical habitat on the DECC NSW Critical habitat register in the locality or of relevance to the assessment of the proposed activity (DECC, 2008f).

6.2 Matters of National Environmental Significance

6.2.1 Assessment under EPBC Act Significance Guidelines

The Commonwealth *Environment Protection & Biodiversity Conservation Act, 1999* (EPBC Act) establishes a process for assessing the environmental impact of activities and developments where 'matters of national environmental significance' may be affected. Under the Act any action, which "has, will have, or is likely to have a significant impact on a matter of national environmental significance" is defined as a "controlled action", and requires approval from the Minister for the Environment, Water, Heritage and the Arts.

A Protected Matters Search (DEWHA 2008) was performed for the proposed activity and is presented as Appendix F. A number of EPBC Act listed threatened species have previously been recorded or are predicted to occur in the locality The NSW Wildlife Atlas (DECC 2008) also revealed records of EPBC Act listed threatened species previously recorded in the locality (refer Figure 7). EPBC Act listed threatened species are discussed above, along with TSC Act listed biota, and described in detail in Appendix C.

The matters of national environmental significance (MNES) listed under the EPBC Act of potential relevance to the study area are:

- Endangered Ecological Communities (eg Grassy White Box Woodland);
- Threatened species (e.g. Superb Parrot, Spotted-tailed Quoll);
- Migratory species (e.g. Swift Parrot); and
- The Macquarie Marshes Ramsar Wetland Site.

6.2.2 Potential Impacts on Nationally Listed Endangered Ecological Communities

The EPBC act listed EEC Grassy White Box Woodland was predicted to occur in the locality by the DEWHA (2008) search engine. Woodland at the site is not consistent with the EPBC Act definition of this EEC (refer Section 5.1.4. The proposed activity would include appropriate environmental mitigation measures and safeguards to ensure that impacts on native vegetation are restricted to the immediate surface disturbance area. Therefore the proposed activity is not likely to affect areas of Grassy White Box Woodland elsewhere in the region.

No other EECs or populations listed under the EPBC Act were recorded or predicted to occur at the site or in the surrounding region

6.2.3 Potential Impacts on Nationally Listed Threatened Species

No threatened flora species listed under the EPBC Act were recorded at the site, however seven threatened species are known or predicted to occur in the locality. These species are presented in Appendix C, along with an assessment of their habitat requirements and likelihood of occurring at the site.

No threatened fauna species listed under the EPBC Act were recorded at the site. One species, the Superb Parrot, occurs in the study area (DECC, 2008a, GHD, 2007, 2008; Corkery and Associates, 2006). A further seven species have been previously recorded in the locality of which four may utilise habitat at the site (refer Appendix C). An assessment of the significance of impacts on EPBC Act listed threatened species was performed and is presented as Appendix E. The outcome of this assessment is that the proposed development is unlikely to have a significant impact on these nationally listed threatened species which may occur at the site.

6.2.4 Potential Impacts on Migratory Species

The study area provides habitat for a number of EPBC Act listed migratory species including waterfowl (Anatidae species) and the Black-winged Stilt, which were observed during field surveys. Native vegetation and wetlands at the site are likely to be used by a range of these migratory species on a periodic basis. This would potentially include use of foraging resources by threatened migratory species including the Superb Parrot, Swift Parrot and Regent Honeyeater. The habitat to be removed is limited in extent (<15 ha total), patchy and subject to ongoing disturbance from mining operations. Therefore the habitats present are not considered to constitute critical or important habitat for any listed species under the migratory bird provisions of the EPBC Act. The proposed activity is also unlikely to create a barrier to migration, increase the risk of injury or mortality or otherwise impact on migratory species. Therefore the proposed amendment is unlikely to impose “a significant effect” on any of the listed migratory fauna species, which could possibly occur in the study area on occasion.

6.2.5 Potential Impacts on the Macquarie Marshes Ramsar Site

The S.75 modification area is within the Lower Slopes CMA Sub-catchment, which is the same catchment as the Macquarie Marshes Ramsar Site. Drainage in the region enters the Macquarie Marshes via network of drainage lines entering the Bogan, Lachlan and Macquarie Rivers. The study area is within the catchment of the Bogan River and so natural water courses in the locality indirectly drain to the Ramsar Site. The hydrology of the S.75 modification area has been extensively modified by mining activities and associated drainage interception works. Surface water management at the operating mine site is based on separation of the ‘clean’ and ‘potentially contaminated’ water sources, minimisation of disturbance and hence opportunities for sedimentation, maximisation of water recycling and operation as a ‘no release’ site (Corkery and Co, 2006). The proposed modifications to the S.75 modification areawould be integrated into this water management system and would not increase the potential for water contamination or off site releases. There is a minimal risk of impacts on water quality in drainage systems outside the site. There is an extremely low risk that if any adverse effects on surface water outside the site occurred they would be severe enough to have any effect on the Macquarie Marshes Ramsar Site, which is greater than 100km from the site.

On the basis of the above considerations, it is concluded that the proposed development is unlikely to impose “a significant effect” on the Macquarie Marshes Ramsar Site provided that the existing environmental management and mitigation measures are implemented.

6.3 Vegetation Clearing and Construction Impacts

6.3.1 Flora

The proposed development would have a surface disturbance area of approximately 152 ha. The majority of this area (approximately 138 ha) is disturbed, cleared land, which contains very little native vegetation cover and has little habitat value for native plants. Any vegetation clearing required in these areas would remove pasture grasses, a small number of individuals of non-threatened native plants and noxious and environmental weeds.

The proposed activity would require the clearing of approximately 14.3 ha of native vegetation as a result of direct surface disturbance during the construction. Vegetation clearing in these communities will involve removal of a moderately diverse range of non-threatened native plants, including mature trees. The extent of clearing of each vegetation community is summarised in Table 8 below.

Table 8 Proposed areas of native vegetation clearing

Vegetation Community	Status	Extent of Clearing (ha)
Yellow Box Woodland	EEC_1	1.14
Grey Box Woodland	EEC_1	5.82
Bimble Box Woodland	EEC_1	4.72
Native grassland	EEC_1	2.68
TOTAL		14.34
1 = TSC Act listed		

6.2.2 Fauna

Native vegetation within the site footprint is shown on Figure 4 and threatened fauna and important habitat resources on Figure 5. The removal of these resources is ‘likely’ to ‘threaten the survival or evolutionary development of species, populations or ecological communities’ within the site. The magnitude of these ‘likely’ impacts is assessed below. The majority of the disturbance footprint for the proposed activity falls within disturbed / cleared land. These areas have been extensively modified by previous mining activities and would have little value for native fauna.

A considerable abundance and diversity of native bird species occupy the site and will be impacted by the removal of native vegetation and other habitat resources. The majority of these species are mobile, widespread and common. Further, there are large quantities of equivalent habitat and resources in the locality and so it is likely that the impact on local populations of native birds will be minor.

Arboreal mammals occur in areas of woodland at the site. A number of microbats were also recorded at the site and would forage across the entire site and potentially roost within the woodland. The proposed activity will remove foraging habitat for these species as well as potential roost sites in the 45 hollow-bearing habitat trees recorded within the disturbance footprint. It is likely that individuals will be adversely affected during clearing, particularly individuals sheltering in tree hollows. Mitigation measures outlined in Section 7 would partially ameliorate impacts on these species.

A moderate diversity and abundance of native frogs and reptiles occupy the site. Species recorded during field surveys are widespread and common (Cogger, 1996) (see Appendix B). It is likely that individuals will be adversely affected during clearing, particularly species which burrow or shelter beneath woody debris. Mitigation measures outlined in Section 7 are likely to ameliorate these impacts.

There is likely to be moderate, ongoing impacts on fauna utilising adjacent areas of habitat during construction associated with noise and other disturbances. There are already disruptive human activities in the vicinity of the site associated with the NPM operations. Heavy machinery operates on NPM 24 hours a day and there is extensive use of security and operational lighting. The surrounding locality is also extensively disturbed by agricultural activities. Larger, more mobile fauna currently occupying the site are likely to be adapted to these disturbances. There is likely to be impacts upon smaller, less mobile fauna in the immediate vicinity of the proposed works.

6.3.2 Habitats

The proposed activity will have a direct negative effect on habitat for native flora and fauna through vegetation clearing as described above. This clearing will have additional negative effects on the quality of habitats in the broader locality through edge effects, fragmentation of habitat and the disruption of fauna movement corridors.

Edge effects refer to the impact of clearing on the surrounding areas of remnant vegetation. Negative impacts may include an increase in incursion of weeds, sedimentation or access for predators. Edge effects are already having pronounced negative effects on habitat in the study area. Existing disturbance associated with NPM has resulted in clearly visible edge effects in native vegetation such as infestation with exotic species around the margins of woodland patches. Complete clearance of areas for the proposal would create new edges along areas of retained vegetation, which would be exposed to additional edge effects. Increasing edge effects can compromise bushland areas by encouraging weed growth, changing light and microclimatic conditions as well as potentially increasing nutrient levels. Some fauna, such as bats and predatory birds, may use the newly created open areas for foraging which would result in increased predation within open areas and along edges by both native and introduced predatory fauna. Measures recommended in Section 7 should be implemented to minimise the potential for these impacts.

The proposed activity will contribute to a barrier to movement of fauna in the locality. The proposed activity will remove approximately 14.3 ha of remnant vegetation, which will completely remove the only wildlife corridor into the s.75 modification area. This will have a significant impact on fauna species which have home ranges located partially or entirely within the s.75 modification area, such as the Grey-crowned Babbler. This corridor would have little value for more mobile species as the habitat to be removed is a 'dead end'. Fauna movement to the east, west and farther south is already limited by existing mining operations.

The modified NPM area would constitute a partial barrier to regional movements of migratory fauna species by increasing the area of non-viable habitat that they need to traverse. Migratory species often rely on 'stepping stones' of suitable foraging and roosting habitat during migrations. By removing 14.3 ha of habitat the proposed activity would increase the distance between suitable patches. In a regional context this would probably comprise a minor effect on these more mobile species but may represent a significant barrier to less mobile species.

The proposed activity will not isolate any vegetation or wildlife corridors outside the surface disturbance area. There is an important east-west wildlife corridor immediately to the north of the site. The proposal will remove 1 ha of remnant vegetation directly joined to this wildlife corridor, which would result in a minor modification by reducing the overall extent of the habitat. However this clearing is at the edge of the corridor and would not isolate or disconnect any vegetation or otherwise impact on fauna movements through the corridor.

6.4 Indirect and Operational Impacts

6.4.1 Contamination of surface waters

Potential sources of contaminated surface water identified for the existing NPM operations (Corkery and Co, 2006) and applicable to the S.75 modification area include:

- Runoff from areas stripped of vegetation;
- Runoff from waste rock and soil stockpiles;
- Runoff/seepage or spillage from TSFs;
- Runoff from hardstand areas including roads, processing areas and site facilities;
- Leakage or spillage of hydrocarbon products from wash down, workshop,
- Refuelling bays and fuel, oil and grease storages; and
- Discharge of mine waters.

Given the extensive existing operations at the NPM site and the existing surface water management systems the proposed modifications are unlikely result in significant impacts on surface waters at the site.

The site currently operates as a zero-discharge site with onsite surface waters completely isolated from surrounding catchments (RW Corkery, 2006). Provided the existing environmental management measures are maintained the s.75 modification is unlikely to result in off-site impacts on surface waters.

6.4.2 Sediments dust and runoff

There is a relatively low risk of impacts associated with erosion and sedimentation due to the absence of any sensitive environmental receptors down slope of the proposed surface disturbance area. Potential indirect impacts to flora and fauna from construction activities would include dust and vehicle exhaust emissions generated from construction vehicles and equipment.

6.4.3 Artificial lighting

The NPM operates 24 hours a day. Night-time security or operational lighting can potentially discourage habitat use where diffuse light penetrates into adjoining areas of vegetation. The foraging regimes of some nocturnal native mammals and birds can be disrupted by lighting and make them vulnerable to predation by cats, dogs and foxes. The eyesight of nocturnal species (such as owls, gliders and possums) is hindered by bright lights, and where they are affected by this, they become more susceptible to predation.

As mining activity would occur on a 24-hour basis, light spill into adjoining areas of habitat can be expected in some parts of the site study area. In addition, it is likely that some lighting may be required for emergencies, maintenance or security. Such lighting should be designed as ‘down lights’ and be directed inwards so as to not spill outside the areas of mining activity, as is existing practice at NPM.

The magnitude of impacts would be low, as resident fauna are likely to have adapted to 24 hour operations currently occurring at the site.

6.4.4 Roads and access

Collisions with wildlife (such as macropods and arboreal mammals) within the mine site are possible, particularly during dusk and dawn when macropods active. The NPM site already experiences moderate to heavy vehicle traffic and so the proposed modifications will not represent a substantial increase in the risk of vehicle collisions with fauna utilising habitats in the local area.

6.5 Long Term Impacts

The operational phase of the proposed mining activities will continue until 2025. After operations have ceased remediation of the site will be undertaken as described in Section

Long-term impacts on native fauna will include the loss of ecological functions and habitat resources that take a long time to develop. These include:

» mature hollow-bearing trees;

» feed trees, since trees must reach full sexual maturity to produce large volumes of blossom and fruit;

» structurally diverse vegetation, with a number of age classes and mature emergents; and

» a healthy soil seed bank, with sufficient number and diversity of propagules to allow the native vegetation to regenerate following disturbances such as bushfire.

Provided the mitigation measures outlined in Section 7 are adopted; in particular the remediation of the site, the proposed activity is unlikely to result in permanent or irreversible impacts on native biodiversity. This includes local populations of native flora and fauna, which are likely to persist in retained and remediated vegetation in the locality and recolonise the site after mine closure.

6.6 Threatening processes

The proposal would contribute to the operation of the following Key Threatening Processes (KTPs):

» Clearing of native vegetation;

» Removal of hollow-bearing trees; and

» Removal of dead wood and dead trees.

The extent of clearing of native vegetation is presented in Table 8.

The proposal will remove approximately 45 stags and/or hollow-bearing habitat trees out of 65 habitat trees identified in the study area during field surveys.

The proposal will disturb a small amount of fallen dead trees within the construction footprint. In line with the groundcover clearance protocol outlined in Section 7.3.1 this is likely to result in short term impacts on resident fauna. The habitat value of the timber will be retained and so this measure would mitigate against the operation of the KTP.

The following KTPs may also be of relevance to the proposed activity:

» Invasion of native plant communities by exotic perennial grasses; and

» Infection of native plants by *Phytophthora cinnamomi.*

Provided the soil and weed management measures outlined in Section 7 are followed, the proposed activity should not result in the operation of, or increase the impact of, any of these KTPs. The likelihood of these KTPs operating is also minimised by the limited extent and duration of the proposed works.

7. Mitigation

7.1 General

The mitigation of adverse effects arising from the s.75 modification has been presented according to the hierarchy of avoidance; mitigation and offsetting of impacts, consistent with the approach outlined in the DEC/DPI (2005) guidelines.

Potential impacts of the s.75 modification on native biota and their habitats will be greatest in the surface disturbance area. These impacts would be greatest during the construction phase due to direct habitat loss and modification. There is also the potential for impacts on habitat outside the disturbance area during the longer-term operational phase of the proposed works (e.g. lights and noise). Specific mitigation measures have been incorporated into the proposal design to minimise such impacts on the natural environment surrounding the s.75 modification area, and in particular to reduce potential impacts on threatened species and their habitats. The potential adverse impacts of the Project Site on flora and fauna and their habitats on site and on surrounding lands will be further reduced through the extension of existing Environmental Management Plans (EMPs) as required under DC 06-0026.

The s.75 modification would result in some unavoidable residual adverse impacts imposed upon some elements of the natural environment, including a 'likely' 'significant negative effect' on the local population of the Grey-crowned Babbler. These residual impacts are not expected to impose a significant negative effect on any other local populations of native biota, including threatened species, EECs and their habitats, which occur on the study site or in adjoining habitats (refer to Impact Evaluation and Conclusion).

An offset package would be required to address these residual adverse impacts to achieve an overall 'maintain or improve' outcome for biodiversity conservation. This offsets package would be developed in consultation with DECC and the DoP and would be included in the Statement of Commitments to accompany the s.75 modification. The following sections detail the mitigation measures and offset package recommended for the s.75 modification.

7.2 Avoidance of Impacts

7.2.1 Project Location & Scope

The majority of the s.75 modification area falls within land which is extensively modified by existing, approved NPM activities. Impacts on native flora and fauna are substantially less than would be associated with an undisturbed 'green field' site.

There was little scope for further avoidance of impacts in the proposed s.75 modification area. The Project Site location is constrained by the location of the operating mine and the associated ore bodies. Therefore there is no scope for locating the proposed activities away from the sensitive environmental receptors identified in this assessment.

7.3 Mitigation of Impacts

7.3.1 Construction Planning

It is recommended that a Construction Environmental Management Plan (CEMP) be developed for the Project Site and include the mitigation measures outlined below.

Surface water management

The CEMP should include surface water management measures, including as a minimum the following principles currently used at NPM operations to manage surface water:

- Ensure the fullest separation possible of ‘clean’, ‘dirty’ and ‘mine’ water runoff.;
- Minimise the area of disturbance, thus minimising the volume of ‘dirty’ or ‘mine’ water runoff;
- Runoff from disturbed and rehabilitated areas will be diverted into sediment ponds and allowed to settle prior to discharge in to the natural system;
- ‘Mine’ water will be collected, stored, recycled and handled in a separate water management system to protect the quality of ‘clean’ and ‘dirty’ water systems; and
- Ensure water management systems adopted at NPM operations do not adversely affect water quantity or quality in downstream water courses (Northparkes Mines, 2007).

Soil management

Soil management should aim to ensure that topsoils are maintained in a form that will maintain their viability for regeneration of the site, minimise risks of erosion, sedimentation and the spread of environmental weeds. This would include measures such as:

- Minimise handling of soils through direct replacement onto progressive rehabilitation areas and careful selection of soil stockpile locations, where possible;
- Original topsoil should be retained and stockpiled to assist in future remediation of the NPM site;
- Minimise handling of soils during periods of high soil moisture (i.e. during or immediately following wet climatic conditions);
- Restrict vehicle access on topsoil stockpiles once created, to minimise compaction, erosion and transfer of weeds;
- Topsoil stockpiles would be positioned away from direct surface water runoff; and
- Topsoil stockpiles should be sown with indigenous native grasses of local provenance as soon as is practicable to minimise the amount of bare earth available for the recruitment of weeds.

Dust

Appropriate construction measures must be incorporated to minimise the generation of dust and associated impacts on adjacent natural environments. These are likely to include:

- Setting appropriate speed limits for construction traffic to limit dust generation; and
- Applying water to internal haul roads during construction, where required.

Pre-clearance Survey

A pre-clearance survey by a qualified ecologist will be required prior to surface disturbance of the Project Site. This should involve:

- Diurnal searches for birds, nests and roosts;
- Targeted searches for Grey-Crowned Babbler nests;
- Active searches for reptiles, including checking of woody debris within the construction footprint,
- Active searches for frogs, focussing on aquatic and wetland habitats;

» Active searches for micro bats, including checking under exfoliating bark; and

» Nocturnal surveys, including stag-watching of identified habitat trees, specifically focusing on observing use of hollows by micro bats.

This survey would focus on locating individuals, and especially roosts of threatened species.

If nests or nestlings of threatened species are observed within, or close to, the surface disturbance footprint then construction should be postponed until the nestlings have hatched and fully-fledged. If construction constraints mean that this delay is not practicable then DECC should be consulted to determine the most appropriate relocation method.

Construction should commence in the south of the Project Site and proceed northwards. This approach would maintain vegetated corridors as long as possible, maximising opportunities for fauna to escape northwards into remnant vegetation to the north of the site.

Tree Fauna Management

Mitigation measures for tree dwelling fauna are required as the proposed works involve the removal of mature trees including hollow-bearing habitat trees. Further, nesting birds were observed in the surface disturbance footprint during field surveys and would potentially occupy the Project Site during construction. Due care during clearing is recommended to reduce direct impacts to any tree dwelling fauna species which may be utilising the area.

The CEMP should detail procedures for fauna management including the following points:

» Habitat trees should be monitored for fauna during clearing operations;

» Habitat trees with resident fauna should be avoided as far as practicable by postponing clearing through these areas. Where it is not practical to clear during these times, the pre-clearance survey should minimise the potential impact on these species; and

» Hollow-bearing habitat trees should be placed in nearby revegetation areas.

Groundcover Clearance Protocol

Groundcover substrate, especially large woody debris, provides important habitat for native fauna, including threatened species. It is recommended that the following protocol be included in the CEMP:

» As part of the preclearing survey a qualified ecologist will identify large woody debris or rock fragments with habitat value that warrants relocation;

» During construction, remove identified large woody debris and rock fragments using excavator grabs, where possible; and

» Place intact large woody debris and rock fragments within nearby revegetation areas.

Site Management

The following mitigation measures are recommended in order to minimise construction impacts of the Project Site:

» Setting appropriate speed limits for construction traffic to reduce the risk of fauna road fatalities; and

» Restrict access into adjacent remnant vegetation during construction by appropriate marking / fencing of surface disturbance footprint.

Weed and Pest Management

It is recommended that the following measures be adopted to manage environmental weeds during construction:

- Stockpiles of fill or vegetation should not be placed in areas of adjoining remnant vegetation but instead within existing cleared areas;
- To limit the spread of weeds into adjoining remnant vegetation the surface disturbance footprint should be temporarily fenced;
- Incorporate control measures in the design of the proposed works to limit the spread of weed propagules downstream of the Project Site;
- Progressive rehabilitation of disturbed vegetation to limit the potential for colonisation by weeds;
- Monitor and control Noxious Weed species in line with legislative obligations; and
- Perform ongoing monitoring of weed infestation on and adjoining the Project Site.

Revegetation and Habitat Enhancement

NPM has, wherever possible, been able to maintain sections of remnant vegetation within its landholding. The four vegetation communities identified across the site consist of small remnants and linear corridors, such as along roadsides. Ongoing revegetation plans aim to provide appropriate linkages between these areas of adjoining vegetation.

As a component of the revegetation program, habitat enhancement should include the placement of logs and tree trunks for ground fauna shelter sites. All hollow bearing trees identified in the pre clearing surveys and removed during construction are to be resited into these revegetation areas to mitigate the loss of habitat resources. All significant woody debris and rock fragments identified during the pre-clearing survey are to be also resited into the revegetation area to provide further shelter habitats for ground fauna.

Linking of existing remnant vegetation with wildlife corridors provides feeding and movement routes for local fauna. Wildlife corridors are established or improved along fence lines, road verges, creeks and drainage lines through an annual revegetation program. This program involves the planting of approximately 10,000 trees per annum, if conditions are suitable, as part of the continuing rehabilitation strategy. In excess of 150,000 trees have been planted to date within the landholding.

The areas planned for revegetation and enhancement expand into the existing cleared areas outside the mine lease. This annual program concentrates on areas adjoining intact remnants to increase their size and viability over time and areas where increased connectivity between remnants can be achieved.

Rehabilitation of the surface disturbance occurring at the Project Site would be undertaken in accordance with the existing rehabilitation strategy already implemented at NPM. Since this rehabilitation strategy would be applied to areas of the NPM site which had previously been cleared it would eventually result in an increase in native vegetation cover at the NPM site and an improvement in the extent and connectivity of habitat in the locality.

7.3.2 Operational Control

NPM operate and manage their environmental impacts under an ISO 14001 certified environmental management system. Environmental operating procedures, management plans and programs are established, documented and maintained for operational activities to reduce, minimise or eliminate potential environmental impacts. These procedures, management plans and programs include but are not limited to: air quality, noise, water management, rehabilitation and mine closure.

It is recommended that the relevant Environmental Management Plans are updated to include the proposed works.

7.4 Offsetting of Impacts

7.4.1 Need for offsetting

The proposed activity would result in residual impacts on native flora and fauna, including:

» Clearing of approximately 14.3 ha of native vegetation including threatened fauna habitat;

» Clearing of TSC Act listed EECs;

» Removal of important habitat resources including remnant native vegetation, a locally important wildlife corridor and approximately 45 hollow bearing trees; and

» 'Likely' significant negative effects on local populations of the TSC Act listed Grey-crowned Babbler.

Therefore biodiversity offsets will be required to accompany s.75 Modification Application in order to satisfy the requirements of the DEC/DPI (2005) guidelines and Part 3A of the EP & A Act. A commitment to develop an appropriate offsets strategy forms part of the Draft Statement of Commitments for the proposed activity and would be included in the Conditions of Consent.

The final details of this offsets strategy would be negotiated between NPM and DECC and would ensure that the s.75 modification 'improves or maintains' biodiversity values.

7.4.2 Current framework for offsetting

Offsets strategies to accompany Part 3A applications may take a variety of forms including:

» Identification and conservation of an offset site and titling with a Voluntary Conservation Agreement (VCA) or equivalent and improvement of native vegetation and habitat value on the offset site through strategic planting, weed control or pest animal control; or

» Purchase of land and contribution of management funds so that the land may be incorporated into the NSW National Parks Estate; or

» Financial contributions to conservation or environmental management programs.

The use of offsetting as a mechanism to mitigate impacts of development and mining on natural resources has gained momentum over the last 2-3 years. Under the current system offsets are negotiated on a 'case by case' basis between the client, DECC and relevant approval authorities. DECC is the lead government agency in negotiating suitable offsets but does not necessarily give final approval to such proposals. Approval for this project is by the DoP through the Part 3A approval process. NPM understands the need to present the DECC and DoP with the necessary information to assist in making such 'balanced' decisions associated with mining projects.

The design and approval of suitable offsets is still negotiated under the same framework, however the NSW Government has recognised the need to formalise a process for assessing appropriate offsets and has gazetted the Biodiversity Banking and Offsets Scheme (BioBanking) (DECC, 2006) to address the loss of biodiversity and threatened species. The scheme creates a market framework for participating landholders and development sites, allowing for both the conservation of biodiversity values in certain sites and also offsetting of impacts in other areas.

It is important to note that participation in the BioBanking scheme is currently voluntary. As such, in some cases it may be prudent to negotiate the impact of the development under the original offsetting process and utilise the BioBanking model to assess the adequacy of on site conservation outcomes and the offset only. It is therefore important to assess the merits of each mechanism thoroughly to determine which can be applied to provide the best results in terms of vegetation conservation and development outcomes.

7.4.3 Offset comparisons

For offsets strategies requiring the conservation of an offset site an appropriate ‘offsets ratio’ would be identified: that is the ratio of the area of vegetation to be cleared to the area of vegetation to be conserved within the offset site. GHD compared a range of comparable offset strategies applicable to the proposed development (i.e. mining projects) and developed a ratio in accordance with relevant guidelines and previous planning decisions for mining projects (GHD, unpub.c).

As part of this process GHD also estimated the offsets ratio that would be required using the BioBanking credit calculator methodology. The application of the BioBanking credit calculator, based on GHD field survey data and assumptions, recommended a larger overall biodiversity offset ratio than currently proposed. However, due to the condition of remnant vegetation, its fragmented distribution across the site and ongoing disturbance associated with existing mining operations it may be argued that a lower ratio is more appropriate. The offset strategy proposed by GHD and NPM would conserve and rehabilitate approx 65 ha of native vegetation to compensate for the loss of approximately 14 ha of native vegetation associated with the development (or an offset ratio of 4.5:1) .

GHD developed this strategy through an analysis of previously approved development projects incorporating offset strategies. The offset strategies reviewed encompass residential, commercial, industrial and mining projects and were accessed through the NSW Department of Planning (DoP) website. Offsetting actions have included conservation, restoration, the payment of financial contributions and combinations of the three.

It is clear that with regards to biodiversity offsets:

» There is limited consistency in offsets approved (Revegetation offset ratios ranges from 2.1 – 4.5:1 Conservation ratios have ranged from 1 - 6.5:1 and financial contributions from $34,290 – $80,000 /ha); and

» The proposed offset for NPM is comparable to, or greater than previous offsets strategies accepted by the DoP.

Examples of projects relevant to the s.75 modification have been summarised in Table 9, below.

Table 9 Offset Ratios Promoted in Various Biodiversity Offset Strategies (GHD, unpub.c).

Offset Policy	Conservation	Revegetation/Restoration
DECC Offsetting Guidelines (2008g)	1:1 (based on ‘like for like’ principle)	2:1 through to 20: 1 (depending on conservation value of vegetation cleared)
Glennies Creek Open Cut Coal Mine	No detail provided	3.83:1 (through conservation and rehabilitation of 254 ha on site & 33 ha off site). Proponent to manage the biodiversity offset areas for the purpose of conservation while ever it retains ownership of these areas
Mount Arthur Coal Mine - South Pit Extension	1.23:1 (loss of 50 ha of woodland and 280 ha of highly disturbed grassland, to be offset by conservation of 395 ha)	Not applicable.

Offset Policy	Conservation	Revegetation/Restoration
East Boggabri Coal Mine	6.4:1 (loss of 78 ha, including 0.5 ha endangered vegetation offset by conservation of 500 ha)	Not applicable.
Mount Owen Coal Mine	1:1 (334 ha conserved based on 'like for like' compensatory habitat. Impacted habitat include 18 species on the TSC Act)	5.2:1 (334 conservation plus 1400 ha through direct seeding and revegetation of some areas as well as management to promote natural regeneration on the balance)

7.4.4 Conclusions

From the research undertaken for projects associated with mining, the proposed attributes of a conservation offset site should include:

» A minimum of 65 hectares of native woodland (a ratio of approximately 4.5:1);

» Recipient site(s) as identified within an adopted rehabilitation management plan;

» 'Like for like' ecological communities, consistent with the vegetation types summarised in Table 9 ;

» A minimum 5-year establishment and maintenance period; and

» Insurance against catastrophic loss (e.g. fire).

Note: These parameters may change depending on the 'mix' of offset actions proposed. NPM may seek conservation outcomes on land, containing remnant vegetation, that is either private land(s) or NPM owned land(s) or a combination of the two.

Table 10 Indicative vegetation types to be conserved in offset site

Vegetation community in s.75 modification area	Area to be cleared (ha)	'Like for like' Vegetation Type(s) for inclusion in offset site
Yellow Box Woodland (Yellow Box tall grassy woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276))	1.1	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201) (LA145) White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267) (LA218) White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion (Benson 266) (LA219) Yellow Box tall grassy woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276) (LA226)
Grey Box Woodland and Native Grassland (Inland Grey Box tall grassy woodland on alluvial loam and	8.5	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and

Vegetation community in s.75 modification area	Area to be cleared (ha)	'Like for like' Vegetation Type(s) for inclusion in offset site
clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76))		Riverina Bioregions (Benson 76) (LA154)
Bimble Box Woodland (Mixed box woodland on low sandy-loam rises on alluvial plains in central western NSW (Benson 248))	4.7	Inland Grey Box - White Cypress Pine tall woodland on sandy loam soil on alluvial plains of NSW South-western Slopes and Riverina Bioregions (Benson 80) (LA153) Mixed box woodland on low sandy-loam rises on alluvial plains in central western NSW (Benson 248) (LA162)
Total	**14.3**	

Therefore to offset impacts associated with the proposed s.75 modification NPM would develop an offsets strategy, in negotiation with DECC, which would:

» Identify 65 ha of land(s), preferably containing appropriate 'like for like' vegetation communities as listed above and ensure they are managed for conservation under secure tenure, in perpetuity, either in the NPWS Estate or under a VCA, or equivalent; or

» Agree to an alternative arrangement with DECC that would ensure an equivalent, or better, biodiversity conservation outcome.

8. Conclusion

8.1 Key Thresholds

Pursuant to DEC/DPI (2005) assessment guidelines development applications under Part 3A must contain a justification of the preferred option based on the following key thresholds.

Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.

Specific impact mitigation and environmental management measures have been recommended for implementation to increase the certainty of the long term maintenance of the biodiversity values of the site during construction and operation of the proposal. This would substantially avert offsite impacts on surface waters, native vegetation and fauna habitats. The proposed activity will not mitigate all impacts on native flora and fauna within the proposed surface disturbance area. There are residual impacts on native biota, including threatened species and EECs. These impacts will require commensurate biodiversity offsets to ensure the proposed activity would “improve or maintain biodiversity values”.

The comparison of ecological impacts, mitigation and offsets associated with the application of the “improve or maintain ” test to the proposed activity are summarised in Table 11.

Table 11 Comparison of ecological impacts, mitigation and offsets

Impact	Mitigation	Offset
» Removal of approximately 14.3 ha of native vegetation including: – Yellow Box Woodland (Box-gum Woodland EEC) 1.13 ha – Grey Box Woodland and Native Grassland (Inland Grey Box Woodland EEC) 8.5 ha – Bimble Box Woodland (Inland Grey Box Woodland EEC) 4.71 ha » Removal of 139 ha of low grade habitat in disturbed / cleared land » Significant negative effect on local populations of the Grey-crowned Babbler » Removal of 45 hollow-bearing habitat trees » Long-term loss of fauna habitat features (habitat trees, diverse vegetation structure etc).	» Remediation and revegetation of the NPM area following mine closure » Habitat enhancement in remediate areas through placement of hollow trees and improvements in habitat connectivity » Retention of fallen timber (salvage of felled trees in development footprint) » Retention of woodland in other parts of the study area » Presence of similar woodland in the locality » Pre-clearing surveys for (and salvage of) resident native fauna » Surface water management, and avoidance of off site impacts » Soil management and avoidance of erosion and sedimentation impacts.	Develop an offsets strategy in consultation with DECC that would: » Identify 65 ha of land(s) containing appropriate ‘like for like’ vegetation communities listed in Table 10 and ensure they are managed for conservation under secure tenure, in perpetuity, either in the NPWS Estate or under a VCA, or equivalent; or » An alternative arrangement with DECC that would ensure an equivalent, or better, biodiversity conservation outcome.

Whether or not the proposal is likely to reduce the long-term viability of a local population of any threatened species, population or ecological community.

The proposed activity will remove up to 14.3 ha of habitat for the Grey-crowned Babbler. Given the extensive disturbance in the local area, including the NPM and surrounding agricultural lands, this habitat would have considerable value for local populations. There is insufficient evidence available to conclude that there is sufficient alternative habitat remaining in the locality to support a displaced local populations. Therefore the proposed activity is likely to reduce the long-term viability of local populations of the Grey-crowned Babbler.

The proposed development is unlikely to impose a significant adverse impact on any other threatened fauna species or their habitats based on the following considerations:

» There are no specific habitat features or resources at the site that suggest any permanent local populations are present;

» There is no evidence of important breeding, roosting or sheltering habitat for any other threatened species at the site;

» The proposal would have a minor affect on migration and dispersal ability as the habitat to be removed is at the southern extreme of a patch of habitat and is a 'dead end', with fauna movement interrupted to the south, east and west by the existing mine; and

» The 14.3 ha of native vegetation to be removed is likely to make a minor overall contribution to the amount of potential habitat available to other threatened species, especially given the fragmented nature of the habitat to be cleared, and ongoing degradation by weed invasion and surrounding mining activities.

Whether or not the proposal is likely to accelerate the extinction of any species, population or ecological community or place it at risk of extinction.

The proposed activity is likely to have a significant negative effect on the Grey-crowned Babbler and would reduce the viability of local populations, as described above. The proposed activity is however, considered unlikely to accelerate the extinction of this, or any other threatened species given the following considerations:

» Local populations of the Grey-crowned Babbler are likely to comprise a very small proportion of the total population of these species;

» Local populations of the Grey-crowned Babbler are more likely to be displaced by the proposed activity than killed;

» The limited extent of clearing relative to the overall distribution of the Grey-crowned Babbler and other threatened species;

» The limited value of habitat within the site, in terms of the overall distribution of the Grey-crowned Babbler and other threatened species, given its isolation, patchiness and ongoing disturbing activities from existing NPM operations;

» The maintenance of connectivity between areas of similar and suitable habitat in surrounding areas; and

» That the proposed development is unlikely to inhibit the movement of migratory or nomadic fauna along recognised corridors or linkages in the locality or region.

Whether or not the proposal will adversely affect critical habitat.

No listed critical habitat will be removed or adversely affected as a result of this proposal.

8.2 Federal EPBC Act Assessment

On the basis of the assessments undertaken, it is concluded that the proposed development is unlikely to impose “a significant effect” on any Matters of National Environmental Significance and hence is unlikely to constitute a controlled action as defined under the EPBC Act. A referral for submission to DEWHA would provide certainty with respect to the determination of whether the proposed action constitutes a controlled action, or otherwise, and consequently if further assessment pursuant to the EPBC Act is required.

9. References

Birds Australia Website Species Profiles http://www.birdsaustralia.com.au/birds/

BOM (2008) http://www.bom.gov.au/index.shtml Australian Government Bureau of Meteorology.

Churchill, S. (1998) *Australian Bats*. Reed New Holland, Sydney.

Cogger, H. (1992) *Reptiles and Amphibians of Australia*. Reed/ Reed New Holland.

Currans,B., Ryan,T., and Gray, I. (1990). Initial investigations of koala distribution in the Upper Nepean Catchment area. (Water Board, Sydney). In *Environmental Science studies in Ecology* R. Whelan and A. Davis (Eds.) pp. 1-29. Biology Department, University of Wollongong: Wollongong.

NSW Scientific Committee (2002) *White box yellow box Blakelys Red Gum woodland - Endangered ecological community determination - final*. DEC (NSW), Sydney.

DEC (2004), *Threatened Biodiversity Survey and assessment: Guidelines for Developments and Activities. Working Draft,* Department of Environment and Climate Change (NSW).

DEC/DPI (2005) *Draft Guidelines for Threatened Species Assessment*, Department of Environment and Climate Change (NSW).

DEC (2006) *Identification Guidelines for Endangered Ecological Communities - White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland),* Department of Environment and Climate Change (NSW).

DECC (2008a) *NPWS Wildlife Atlas data for Forbes 1:100,000 Map Sheet.* Department of Environment and Climate Change (NSW).

DECC (2008b) *Department of Environment and Climate Change (NSW) Threatened Species profiles website* http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx

DECC (2008c) *NSW Scientific Committee Final Determination: White Box Yellow Box Blakely's Red Gum Woodland*. http://www.environment.nsw.gov.au/determinations/BoxgumWoodlandEndComListing.htm

DECC (2008d) NSW Scientific Committee Final Determination: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions http://www.environment.nsw.gov.au/determinations/EucalyptusMicrocarpaEndCom.htm

DECC (2008e) *Department of Environment and Climate Change (NSW) Definitions of vegetation types for CMA areas.* http://www.nationalparks.nsw.gov.au/npws.nsf/content/biometric_tool

DECC (2008f) *Department of Environment and Climate Change (NSW) critical habitat register* *http://www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm*

DECC (2008g). *Principles for the use of biodiversity offsets in NSW*. Department of Environment and Climate Change (DECC) (NSW). Last updated 21st October 2008.

DEH (2006) *EPBC Act Policy Statement 1.1. Significant Impact Guidelines. Matters of National Environmental Significance. May 2006*. Commonwealth Department of the Environment, Water, Heritage & the Arts, Canberra.

DEW Threatened Species Scientific Committee (2006a). *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Department of the Environment, Water, Heritage and the Arts, Canberra.

DPI (2008), *Profiles for species, populations & ecological communities – Lachlan River EEC* http://pas.dpi.nsw.gov.au/Species/Species_Profile.aspx?SpeciesListingID=22.

Garnett TS and Crowley GM (2000), *The Action plan for Australian Birds,* Environment Australia, 2000

Gibbons, P. and Lindenmayer, D.B. (2002) Tree hollows and wildlife conservation in Australia. CSIRO Publishing.

GHD (unpub.a) *Northparkes Mine Pre-clearance survey (December 2007),* Unpublished report by GHD for Northparkes mine (our reference: 2312359/71015).

GHD (unpub.b) *Anna's Island Pre-clearing survey (September 2008)*, Unpublished report by GHD for Northparkes Mine (Our reference: 12857/72487).

GHD (unpub.c) *Report for NPM Section 75W Modification Offset Strategy.* Unpublished report by GHD for Northparkes Mine (Our reference: 21/17903/684).

Harden, G. (Ed) (1990-1993) *Flora of New South Wales – Vols 1 – 4.* University of New South Wales Press, Sydney.

Keast A, Recher, HF, Ford H and Saunders D, (1985), *Birds of Eucalypt Forest and Woodland: Ecology, Conservation, Management,* Surrey, Beatty and Sons Pty Ltd in assoc with RAOU.

Keith, D (2004) *Ocean shores to desert dunes – Native vegetation of NSW and the ACT*, DEC, Hurstville NSW.

Northparkes Mines (2007) *Management Plan Sitewide Water,* Objective No: A480459. ESHMS No:9.109.F. ESHMS SOP/Std No: ESHMP109.36. Revision No: 3.

NSW Scientific Committee, (March 2002) *Final Determination: White Box Yellow Box Blakely'sRed Gum Woodland.*

Pizzey, G. (1999) *The Graham Pizzey and Frank Knight Field Guide to the Birds of Australia*. Angus and Robertson, Sydney.

Simpson, K., Day, N. (1995) *Field Guide to the Birds of Australia*. Penguin Books.

Specht R.L. (1970) vegetation. In: *The Australian environment.* (Ed. G.W. Leeper). pp. 44-67. CSIRO and Melbourne University Press, Melbourne.

Strahan, R. (2002) *The Mammals of Australia*. New Holland.

The Action Plan for Australian Birds 2000 Website
http://www.deh.gov.au/biodiversity/threatened/publications/action/birds2000

Tindall, D, Pennay C, Tozer M, Turner K and Keith, D, *Native vegetation map report series No. 4*, DNR. Unpublished.

Triggs, B (2004) *Tracks, scats and other traces. A Field Guide to Australian Mammals*. Oxford Press.

Threatened Species Scientific Committee [TSSC], 2006, *Advice to the Minister - White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands*

Ward, S.J. and Close, R. (2004) *Southern Sydney's urban koalas: Community research and education at Campbelltown.* Pp 44-55 in Lunney, D. and Burgin, S. (eds) Urban Wildlife: more than meets the eye. Royal Zoological Society of NSW, Mosman.

White, A (2006), *Frogfacts No 5, Green and Golden Bell Frogs*, Frog and Tadpole Study Group, Sydney, NSW.

Appendix A

Flora Species List

Scientific Name	Q4	Q1- Q3, Q5,Q6 R1-R3 and incidentals
Acacia pendula		ü
Acacia sp		ü
Alectryon tenuifolia		ü
Allocasuarina cristata		ü
*Arctotheca calendula**		ü
Arthropodium minus		ü
Asperula conferta		ü
Austrodanthonia setacea		ü
Austrodanthonia sp.	ü	ü
Austrostipa birchii		ü
Austrostipa bigeniculata		ü
Austrostipa scabra	ü	ü
Austrostipa setacea	ü	ü
Austrostipa sp.	ü	ü
Avena fatua		ü
Brachyscome ciliaris		ü
*Brassica juncea**	ü	ü
*Brassica tournefortii**		ü
*Bromus diandrus**		ü
Bromus hordeaceus		ü

Bulbine bulbosa	ü	ü
Callitris glaucophylla		ü
Calotis lappulacea	ü	ü
*Capsella bursa**		ü
Carex inversa		ü
Centaurea melitensis		ü
Chamaesyce drummondii	ü	ü
Cheilanthes austrotenuifolia		ü
Chloris gayana		ü
Chloris truncata		ü
*Cirsium vulgare**		ü
Calycine tabacina		ü
Convolvulus erubescens		ü
Cucumis myriocarpus		ü
Dichondra repens		ü
Dodonaea viscosa		ü
Dodonaea viscosa subsp spatulata		ü
Echium plantagineum		ü
Einadia nutans subs linifolia		ü
Einadia polygonoides		ü
Enchylaena tomentosa		ü

Entolasia stricta		ü
Eragrostis parviflora		ü
Eremophila drummondii		ü
Eremophila debilis		ü
Eremophila mitchellii		ü
Eucalyptus melliodora	ü	
Eucalyptus microcarpa	ü	ü
Eucalyptus populneus		ü
Glycine canescens		ü
Glycine tabacina		ü
Goodenia fascicularis		ü
Goodenia pinnatifida		ü
Helipterum corymbiflora		ü
*Hordeum leporinum**		ü
*Hypochaeris radicata**		ü
*Lactuca serriola**		ü
*Lepidium africanum**	ü	ü
Leptorhynchos sp.		ü
Lolium rigidum		ü
Maireana enchylaenoides		ü
Maireana microphylla		ü

*Malva parviflora**		ü
*Marrubium vulgare**		ü
Medicago minima		ü
*Medicago polymorpha**		ü
Medicago praecox		ü
*Oxalis corniculata**		ü
*Oxalis pes-capre**		ü
Panicum effusum		ü
Plantago cunninghamii		ü
Plantago sp.		ü
Ptilotus semilanatus		ü
Rhodanthe troedelii	ü	ü
*Rumex brownii**		ü
*Rumex crispus**		ü
Salsola kali		ü
Salvia verbenaca		ü
Sclerolaena diacantha		ü
Sclerolaena muricata		ü
Sida corrugata		ü
Sida cunninghamii		ü
*Sisymbrium orientalis**		ü

*Sisymbrium sp.**	ü	ü
*Solanum nigrum**		ü
Solanum sp.		ü
Solenogyne sp.	ü	ü
*Sonchus oleraceus**		ü
*Taraxacum officinale**		ü
Tricoryne elatior		ü
Triticum sp.		ü
Typha orientalis		ü
Vicia hirsuta		ü
Vittadinia cuneata	ü	ü
Wahlenbergia communis		ü
Wahlenbergia gracilis		ü
*Xanthium occidentale**		ü

Appendix B

Fauna Species List

Table 12 Fauna species list

Scientific Name	Common Name	Observation type
Frogs		
Limnodynastes tasmaniensis	Spotted Grass Frog	Seen
Crinia parainsignifera	Beeping Toadlet	Heard
Litoria peroni	Peron's Tree Frog	Seen/heard
Litoria latopalmata	Broad-palmed Frog	Seen/heard
Litoria rubella	Desert Tree Frog	Seen
Birds		
	Pacific Heron	Seen
Falco cenchroides	Nankeen Kestrel	Seen
Northiella haematogaster	Blue Bonnet	Seen
Cracticus nigrogularis	Pied Butcherbird	Seen
Barnardius zonarius barnardi	Mallee Ringneck	Seen
	Apostle bird	Seen
Pomatostomus temporalis temporalis	**Grey-crowned Babbler**	**Seen**
	White throated Gerygone	Seen
	Little Corella	Seen
	Hoary headed Grebe	Seen
	Pied Stilt	Seen
Elanus axillaris	Black-shouldered Kite	Seen
	Australian Reed Warbler	Seen
Ninox novaeseelandiae	Southern Boobook	Seen
Tyto alba	Barn Owl	Seen
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	Seen
Anas gracilis	Grey Teal	Seen
Anas superciliosa	Pacific Black Duck	Seen
Cacatua sanguinea	Little Corella	Seen
Chenonetta jubata	Australian Wood Duck	Seen
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Seen
Corcorax melanorhamphos	White-winged Chough	Seen

Scientific Name	Common Name	Observation type	
Corvus coronoides	Australian Raven	Seen	
Cracticus torquatus	Grey Butcherbird	Seen	
Dacelo novaeguineae	Laughing Kookaburra	Seen	
Egretta novaehollandiae	White-faced Heron	Seen	
Eolophus roseicapillus	Galah	Seen	
Grallina cyanoleuca	Magpie-lark	Seen	
Gymnorhina tibicen	Australian Magpie	Seen	
Hirundo neoxena	Welcome Swallow	Seen	
Malurus cyaneus	Superb Fairy-wren	Seen	
Manorina melanocephala	Noisy Miner	Seen	
Ocyphaps lophotes	Crested Pigeon	Seen	
Pardalotus striatus	Striated Pardalote	Seen	
*Passer domesticus**	House Sparrow	Seen	
Philemon citreogularis	Little Friarbird	Seen	
Platycercus adscitus eximius	Eastern Rosella	Seen	
Podargus strigoides	Tawny Frogmouth	Seen	
Psephotus haematonotus	Red-rumped Parrot	Seen	
Rhipidura leucophrys	Willie Wagtail	Seen	
*Sturnus vulgaris**	Common Starling	Seen	
Tachybaptus novaehollandiae	Australasian Grebe	Seen	
Vanellus miles	Masked Lapwing	Seen	
Mammals			
Chalinolobus gouldii	Gould's Wattled Bat	Recorded	Definite
*Lepus capensis**	Brown Hare	Seen	
Macropus giganteus	Eastern Grey Kangaroo	Seen	
Wallabia bicolor	Swamp Wallaby	Seen	
Mormopterus Sp. 4		Recorded	Definite
*Oryctolagus cuniculus**	Rabbit	Seen	
Petaurus sp.	A glider	Seen	
Scotorepens balstoni		Recorded	Definite
Scotorepens greyii		Recorded	Probable

Scientific Name	Common Name	Observation type	
Tadarida australis		Recorded	Definite
Trichosurus vulpecula	Common Brushtail Possum	Seen	
Vespadelus vulturnus	Little Forest Bat	Recorded	Definite
*Vulpes vulpes**	Fox	Seen	
Reptiles			
Pogona barbata	Bearded Dragon	Seen	
Lampropholis guichenoti	Grass Sun skink	seen	
** = introduced species **bold** = threatened species*			

Appendix C

Threatened Species Records

Table 13 Threatened species, populations and EECs known or predicted to occur in the locality and their likelihood of occurrence at the site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
Endangered Ecological Communities	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Grey Box Woodland	E		Inland Grey Box Woodland occurs on fertile soils of the western slopes and plains of NSW. The community generally occurs where average rainfall is 375- 800 mm pa and the mean maximum annual temperature is 22-26°C	Present. This ecological community was observed during the survey period, it makes up a major component of the woodland within the study area.
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland	Box Gum Woodland	E		Tablelands and western slopes of NSW, typically on fertile substrates in lower parts of the landscape from the Queensland to Victorian Boarder.	Present. Identified within the study area
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Box Gum Woodland		C	Tablelands and western slopes of NSW, typically on fertile substrates in lower parts of the landscape.	Absent. This ecological community was not identified during the survey despite targeted survey in appropriate areas during ideal survey conditions.
	Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River		E		The Lowland Catchment of the Lachlan River is part of the Murray-Darling Basin. The area covered by this recommendation includes all natural rivers, creeks, streams and associated lagoons, billabongs, lakes, wetlands, paleochannels, floodrunners, effluent streams (those that flow away from the river) and the floodplains of the Lachlan River within the State of New South Wales, and including Lake Brewster, Lake Cargelligo and Lake Cowal. Excluded from this recommendation are the	Absent. There is no natural aquatic habitat at the site.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					man-made canals, off-stream reservoirs, water distribution and drainage works, and farm dams	
	Fuzzy Box on alluvials of South West Slopes, Darling Riverine Plains & the Brigalow Belt South	Fuzzy Box Woodland	E		Occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. Often occurs upslope from River Red Gum communities above frequently inundated areas of the floodplain. It also occurs on colluvium soils on lower slopes and valley flats.	Absent. There is no suitable geomorphology for this community at the site.
	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions	Weeping Myall Woodland	E		This ecological community is scattered across the eastern parts of the alluvial plains of the Murray-Darling river system. Typically, it occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall.	Absent. *Acacia pendula* is present at the site, but occurs as a sub-canopy species in Bimble Box Woodland and does not form a woodland consistent with this EEC. Further, the Bimble Box Woodland occurs on lower slopes, whereas the EEC is associated with alluvial flats.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
Flora						
Apocynaceae	*Tylophora linearis*		E	E	Found in the Barraba, Mendooran, Temora and West Wyalong districts in the northern and central western slopes of NSW. Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of *Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla* and *Allocasuarina luehmannii*	Low. The subject site does not contain preferred habitat and this species was not detected despite survey effort.
Fabaceae (Faboideae)	*Swainsona sericea*	Silky Swainsona-pea	V		Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines *Callitris* spp. Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains	Medium. Suitable habitat for the species at the site. May persist as dormant individuals in the soil seed bank or potentially colonise the site.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
Poaceae	*Austrostipa wakoolica*	A Spear Grass	E	E	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Associated species include *Callitris glaucophylla, Eucalyptus microcarpa, E. populnea, Austrostipa eremophila, A. drummondii, Austrodanthonia eriantha* and *Einadia nutans*.	Medium. Suitable habitat for the species at the site. May persist as dormant individuals in the soil seed bank or potentially colonise the site.
Poaceae	*Austrostipa metatoris*	A Spear Grass	V	V	Occurs in the Murray Valley, from the central-western slopes to the far south-western plains. Sites include Cunninyeuk Station, Stony Crossing, Kyalite State Forest and Lake Cargelligo. Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. Associated species include *Eucalyptus populnea, E. intertexta, Callitris glaucophylla, Casuarina cristata, Santalum acuminatum* and *Dodonaea viscosa*	Low. Prefers sandy soils in upper parts of the landscape.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
Rutaceae	*Philotheca ericifolia*		V	V	Known only from the upper Hunter Valley and Pilliga to Peak Hill districts of NSW. The records are scattered over a range of over 400 km between West Wyalong and the Pilliga Scrub. Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies. It has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops.	Low. There are no damp sandy flats and gullies at the site.
Rutaceae	*Zieria ingramii*	Keith's zieria	E	E	Known only from Goonoo Goonoo State Forest, about 40 km north-east of Dubbo. An old record exists from a locality east of Mogriguy. Grows in dry sclerophyll forest on light sandy soils. All known populations have been recorded in *Eucalyptus-Callitris* woodland or open forest with a shrubby to heathy understorey	Low. There are no light sandy soils suitable at the site and its known distribution is limited.
Orchidaceae	*Diuris tricolor*	Pine Donkey Orchid	V	V	This species is a tuberous terrestrial species, with a flower stalk 20 to 40 cm high, flowering in September and November with bright yellow to orange flowers speckled with red, purple, or white flecks. It is sporadically distributed along the western slopes of NSW, growing in sclerophyll forests among grass, often with native Cypress Pine (Callitris sp.). It is found on sandy soils, and may appear to favour disturbed soils (DEC 2007).	Low. No sandy soils at the site. Known associated overstorey species not well represented within the study area. Was not observed despite survey in ideal conditions.
Fabaceae	*Swainson murrayana*	Slender Darling Pea	V	V	The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and	Medium. Suitable habitat for the species at the site. May persist as dormant individuals in the soil seed bank or potentially colonise

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated	the site.
Fauna						
	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		This species of insectivorous bat forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. This species roosts in tree hollows and buildings and in areas where trees are scarce or absent, and has been known to utilise mammal burrows. Breeding takes place between December and mid-March. T (DEC 2007).	Present. Recorded at the site in the Corkery and Associates (2007) assessment. Suitable foraging habitat and potential roosting habitat in woodland at the site.
	Polytelis swainsonii	Superb Parrot	V	V	Generally inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. It nests in hollows in small colonies, often with more than one nest in a single tree. It forages up to 10 km from nesting sites, primarily in grassy box woodland, feeding mainly on grass seed and herbaceous plants, fruits, berries, nectar, buds, flowers, insects and grain. (DEC 2007).	High. Suitable foraging habitat in woodland at the site and recent records in the locality. Unlikely to breed at the site.
	Leipoa ocellata	Malleefowl	V		Inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300-450 mm mean annual rainfall) areas. Less frequently found in other eucalypt woodlands (e.g., mixed Western Grey Box and Yellow Gum or Bimble Box, Ironbark-	Low. No malee habitat in locality and not observed in the region for many years.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					Callitris Pine, Callitris Pine, Mulga (Acacia aneura), and Gidgee (A. cambagei). It prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy, dense and variable shrub and herb layers. Malleefowl will occupy areas within five years of fire, however they prefer older age classes. A pair may occupy a range of between 50 and 500 ha, overlapping with those of their neighbours. Mainly forage in open areas on seeds of acacias and other native shrubs (Cassia, Beyeria, Bossiaea), buds, flowers and fruits of herbs and various shrubs, insects (cockroaches, ants, soil invertebrates), and cereals if available. (DEC 2005).	
	Calyptorhynchus lathami	Glossy Black-cockatoo	V		Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (Allocasuarina littoralis), Forest She-oak (A. torulosa) or Drooping She-oak (A. verticillata) occur. Dependent on large hollow-bearing eucalypts for nest sites.	Low. There was only one mature feed tree observed during the survey period.
	Lophoictinia isura	Square-tailed Kite	V		In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Low. This species has a preference for timbered watercourses which are not present in the study area however this may form part of a larger foraging range

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
	Stictonetta naevosa	Freckled Duck	V		Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Low. Wetlands at the site are too small and lacking in semiaquatic vegetation.
	Chalinolobus picatus	Little Pied Bat	V		This species of bat is found in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings in dry open forest and woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, and Bimble box communities. (DEC 2007).	Medium. May forage and potentially roost in woodland at the site on an occasional or opportunistic basis.
	Nyctophilus timoriensis	Eastern Long-eared Bat	V	V	This species of small bat occurs in lowland subtropical rainforest and wet and swamp eucalypt forest, particularly in coastal areas, extending into adjacent areas of moist eucalypt forest in Northern NSW. Roosting occurs in tree hollows,in the hanging foliage of palms and dense clumps of foliage of rainforest trees, and under bark. Threats include habitat loss and fragmentation of rainforest and other coastal remnant forest vegetation for urban, agricultural, and industrial development, loss of hollow bearing trees, exotic weed invasion, and the use of pesticides (DECC 2008).	Medium. May forage and potentially roost in woodland at the site on an occasional or opportunistic basis.
	Lathamus discolor	Swift Parrot	E	E	The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Favoured feed trees include winter	Medium. May forage in winter-flowering or lerp-infested trees in woodland at the site on an occasional basis.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis and Swift Parrots will return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum E. globulus. (DECC 2005)."	
	Pyrrholaemus saggitatus	Speckled Warbler	V		The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Large, relatively undisturbed remnants are required for the species to persist in an area	Medium. May forage in woodland at the site on an occasional or opportunistic basis. This species prefers large intact areas of woodland and so woodlands at the site is unlikely to sustain a local population.
	Burhinus grallarius	Bush Stone-curlew	E		Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	Medium. May forage in woodland at the site on an occasional or opportunistic basis. .

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
	Grantiella picta	Painted Honeyeater	V		This species of small bird feeds primarily on the fruits of mistletoes growing on woodland eucalypts and acacias. Its preferred diet consists of the mistletoe genus Amyema, however it is also known to eat insects and Mistletoe nectar. This species is nomadic, occurring at low densities throughout its range. Most breeding occurs on the inland slopes of the Great Dividing Range in NSW, and this is where the greatest densities of this species are found. (DECC 2007).	Medium. May forage in woodland at the site on an occasional or opportunistic basis.
	Melithreptus gularis gularis	Black-chinned honeyeater (eastern sub-species)	V		Occupies mostly upper levels of drier open forest or woodlands dominated by Box and Ironbark eucalypts, as well as open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees. This species usually occurs in pairs or is nomadic. It forages along twigs, branches, and trunks probing for insects. Nectar is taken from flowers and honeydew is gleaned from foliage. The Black-chinned Honeyeater nests high in the crown of a tree in the uppermost lateral branches (DEC 2007).	Medium. May forage in woodland at the site on an occasional or opportunistic basis.
	Phascolarctos cinereus	Koala	V		The Koala has a fragmented distribution throughout eastern Australia. It is limited to areas of preferred feed trees in eucalypt woodlands and forests. Along the coastal fringe these areas are becoming more fragmented and isolated due to urbanisation. he size of their home range varies depending on the quality of habitat, ranging from less than 2 ha to several hundred hectares in size. Females breed at two years of age and produce one	Medium. May forage in woodland at the site on an occasional or opportunistic basis.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					young per year (DEC 2005).	
	Pteropus poliocephalus	Grey-headed Flying-fox	V		This species roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species is known to forage in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps on the nectar and pollen of native trees, in particular eucalypts, melaleucas and banksias. Grey-headed Flying-fox show a regular pattern of seasonal movement with much of the population moving to northern NSW and QLD during May and June where they exploit the winter flowering trees such as Swamp Mahogany, Forest red gum and Paperbark (NSW Scientific Committee 2004). This species will also forage in urban gardens and cultivated fruit crops (DEC 2007).	Medium. May forage in woodland at the site on an occasional or opportunistic basis.
	Xanthomyza phrygia	Regent Honeyeater		E	This species is a semi-nomadic species that inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak where there are significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests,	Medium. May forage in woodland at the site on an occasional or opportunistic basis during seasonal migrations.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					particularly on the central coast and occasionally on the upper north coast (DEC 2007).	
	Dasyurus maculatus	Spotted-tailed Quoll	V	E	Inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are found in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, which are usually traversed along densely vegetated creek lines. (DEC 2007).	Medium. May forage in woodland at the site on an occasional or opportunistic basis.
	Grus rubicunda	Brolga	V		Brolgas feed in dry grassland, ploughed paddocks and desert claypans, however are dependent on wetlands, especially shallow swamps, where they forage with their head entirely submerged. They feed on sedge roots and tubers, large insects, crustaceans, molluscs and frogs. They build a nest comprising a platform of grasses and sticks, augmented with mud, on an island or in the water. (DEC 2007)."	Medium. May use wetland and grassland foraging habitat at the site on an occasional or opportunistic basis. Unlikely to breed on site due to disturbance, small size of wetlands and lack of islands.
	Neophema pulchella	Turquoise Parrot	V		This species of parrot occurs in open eucalypt woodlands and forests, typically with a grassy understorey. It favours the edges of woodlands adjoining grasslands or timbered creek lines and ridges. A granivorous species, the Turquoise Parrot feeds on the seeds of native	Medium. Suitable foraging and breeding habitat present in woodland at the site.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					and introduced grasses and other herbs. Grasslands and open areas provide important foraging habitat for this species while woodlands provide important roosting and breeding habitat. This species nests in tree hollows, logs or posts from August to December. (DEC 2007).	
	Cacatua leadbeateri	Pink Cockatoo	V		Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines	Medium. Suitable foraging habitat and potential breeding habitat at the site.
	Melanodryas cucullata	Hooded Robin	V		It is considered a sedentary species, but local seasonal movements are possible. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. (DECC 2007).	Medium. Suitable habitat for the species in woodland at the site .
	Stagonopleura guttata	Diamond Firetail	V		Open woodland with understorey of native grasses and intact fallen timber and leaf litter. a	Medium. Suitable habitat in woodland at the site.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
	Climacteris picumnus	Brown Treecreeper	V		Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. The study area is on the boarder of the Eastern and arid species distribution.	Medium. This species is likely to inhabit woodlands within wider locality
	Lophoictinia isura	Square-tailed Kite	V		Although this species shows a preference for timbered watercourses, they have been found in a variety of habitats including woodlands and open forests. It appears to occupy large hunting grounds and breeds from July - February with nests generally located along of near watercourses. It is a solitary bird, and a specialised predator, taking small passerines, especially honeyeaters and their eggs and nestlings as well as large insects in the tree canopy. It generally hunts low over open forest, woodlands and mallee communities, heaths, and other low scrubby habitats that are rich in passerines. This species prefers a structurally diverse landscape with a broad range of habitats and appears to utilise a large range greater than 100 km 2 (DEC 2007).	Medium. This species may utilise foraging habitat in the study area on an occasional basis
	Ninox connivens	Barking Owl	V		Inhabits eucalypt woodlands, open forest, swamp woodlands, and, especially in inland areas, timber along watercourses. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or in dense	Medium. This species may utilise foraging habitat in the study area on an occasional basis

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					clumps of canopy leaves in large eucalypts. The Barking owl feeds on a variety of prey, with invertebrates predominant for most pf the year, and birds and mammals such as smaller gliders, possums, rodents and rabbits important during breeding. This species lives alone or in a pair with territories ranging from 30 to 200 hectares. Nests are built in hollows of large, old eucalypts including River Red Gum (Eucalyptus camandulensis), White Box (Eucalyptus albens), Red Box (Eucalyptus polyanthemos), and Blakely's Red Gum (Eucalyptus blakelyi)(DEC 2007).	
	Falco hypoleucos	Grey Falcon	V		Inhabits shrubland, grassland and wooded watercourses of arid and semi-arid regions, and occasionally open coastal woodlands within the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Breeding only occurs within arid areas of the Great Dividing Range. Nesting occurs in disused nests of other birds of prey and ravens, high in a living eucalypt near water or a watercourse. Breeding occurs in late winter and early spring. (DEC 2007).	Medium. This species may utilise foraging habitat in the study area on an occasional basis.
	Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern Subspecies)	V		This species inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. It lives in family groups that consist of up to fifteen individuals. All members of the family group remain close to each other when foraging, feeding on invertebrates, either on the trunks and branches of eucalypts and other woodland trees, or on the ground digging and	Present. Up to five individuals were observed repeatedly in woodland at the site, and there is evidence of nesting. The site is likely to comprise part of the home range of a local population of this species.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					probing amongst litter and tussock grasses. Territories range from 1 to 50 hectares (usually around 10 hectares), and are defended all year round. (DEC 2007).	
	Rostratula benghalensis	Painted Snipe (was Australian Painted Snipe)	E	V, M	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. This cryptic species nests on the ground amongst tall reed-like vegetation near water. It emerges from the dense growth at dusk to feed on mudflats and the water's edge taking insects, worm and seeds (DEC 2007). This species prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Low. Wetland habitat at the site is too small in extent and/or lacking dense growth of semi-aquatic vegetation.
	Macquaria australasica	Macquarie Perch	V		This species of freshwater fish inhabits river and lake habitats, especially the upper reaches of rivers and their tributaries. Spawning occurs in spring and summer in shallow upland streams or flowing sections of river systems. This species is found in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers, and in parts of the Hawkesbury and Shoalhaven catchment areas (DECC 2007).	Low. No natural aquatic habitat at the site nor opportunity for recruitment from habitat off site.
	Maccullochella peelii peelii	Murray Cod		V	The Murray Cod is found in a wide range of warm water habitats, from clear, rocky streams to slow-flowing turbid rivers and billabongs (McDowall 1996). Generally, they are found in waters up to 5 m deep and in sheltered areas with cover from rocks, timber or overhanging	Low. No natural aquatic habitat at the site nor opportunity for recruitment from habitat off site.

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Likelihood of Occurrence
					banks (Kearney & Kildea 2001). The species is highly dependant on wood debris for habitat, using it to shelter from fast-flowing water (Koehn 1997).	

Appendix D

Part 3A Threatened Species Assessment

Threatened Flora

There is potential habitat for three TSC Act listed flora species at the site:

- *Austrostipa wakoolica* (A Spear-grass)
- *Swainsona sericea* (Silky Swainson pea)
- *Swainsona murrayana (*Slender Darling Pea*)*

Suitable habitat for these species is present in woodland and derived native grassland at the site. Although these species were not detected during field surveys threatened plants may colonise habitat at the site in the future or may exist in the soil seed bank or as dormant individuals. They are very unlikely to occur in disturbed land at the site due to historic removal and modification of the soil seed bank , ongoing competition from exotic species, and loss through grazing from introduced herbivores.

The significance of adverse impacts on these species and their habitats is assessed below.

i) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

a) displaces or disturbs threatened species and/or populations;

The proposal is unlikely to displace or disturb these threatened species as no individuals were recorded in these heavily disturbed fragments of native vegetation nor have they been previously recorded within the locality.

b) disrupts breeding cycle;

Not applicable (NA) for any of the listed flora species. Refer to Section g) for assessment relevant to plants.

c) disturbs the dormancy period;

NA for any of the listed flora species.

d) disrupts roosting behaviour;

NA for any of the listed flora species.

e) changes foraging behaviour;

NA for any of the listed flora species.

f) affects migration and dispersal ability;

Not applicable (NA) for any of the listed flora species. Refer to Section h) for assessment relevant to plants.

g) disrupts pollination cycle;

Austrostipa wakoolica relies on the wind to disperse its pollen. The proposed activity is unlikely to remove any adult individuals, isolate any areas of habitat from the wind or otherwise disrupt the pollination cycle of *A. wakoolica* or any other native grasses.

Information on pollinators for the two S*wainsona* species was not available. As members of the Family Fabaceae subf. Faboides they probably rely on bees or similarly sized insect pollinators. The proposal will result in the loss of only a small percentage of the potential *Swainsona* habitat as well as habitat for potential pollinators from the surrounding region and would have a minor effect on their overall population, should they occur locally. Considering the extent of planted vegetation screens surrounding the mine site as well as the vegetation retained in the locality, retained fragments will not be isolated by the proposal in terms of pollinator movements and is unlikely to create significant barriers within the landscape for these insects. As such the proposal is unlikely to disrupt the pollination cycle of either of these species, should they occur in the locality.

h) disturbs seedbanks;

The proposal will result in the complete disturbance of the soil seedbank in 14.3 ha of potential habitat for these two plant species. Topsoil from these areas will be retained separately from subsoil and stockpiled for use in remediation of the site. However, the operational life of the Northparkes Mine after the s.75 modification would continue until 2025 and given this length of time until the topsoil is reused this would effectively result in the composting and removal of the soil seed bank from these areas.

Despite this, these species have not been previously recorded in the locality and are unlikely to occur in this location, therefore the removal of this soil seed bank is unlikely to remove seed of these species. The proposed activity will not disturb the soil seed bank in remnant vegetation outside the surface disturbance area.

i) disrupts recruitment (i.e. germination and establishment of plants);

None of these species have been recorded within the locality and so there is no direct evidence that habitat at the site is important for connecting local populations or allowing for germination or recruitment. It is unlikely that habitat at the site would be important for the maintenance of local populations (should they occur) as it is surrounded by areas of severely disturbed cleared land. The proposal is unlikely to disturb pollinators nor comprise an obstacle to wind-aided pollination (see section g). The proposed activity would have a minor impact by reducing the overall area of potential habitat that these species could potentially colonise in the future.

j) affects the interaction between threatened species and other species in the community (eg. Pollinators, host species, microrrhizal associations).

The proposal is unlikely to disrupt any known pollinators (see section g above).

Only a small percentage of potential habitat will be removed for these species. Neither has been previously recorded within the locality and alternative habitat exists within the study area and locality. Environmental management measures should ensure that negative effects from the proposed activity would be confined to the surface disturbance area, and thus the proposal is unlikely to affect interactions with other species in the community in habitat outside the site.

ii) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

a) disturbs any permanent, semi permanent or ephemeral water bodies;

The proposed activity would disturb a number of permanent, semi-permanent or ephemeral water bodies. This would have a negligible effect on the two *Swainsona* species however may effect potential habitat for *Austrostipa wakoolica* which occurs in moist habitats. All of the wetlands within the surface disturbance area are artificial features associated with local alteration of surface drainage by mining activities. These areas could not continue original populations of *Austrostipa wakoolica* but may comprise potential derived habitat. Construction associated with the proposed activity would result in a similar amount of artificial wetlands and an equivalent amount of potential habitat for the species.

b) degrades soil quality;

Measures to contain impacts from construction including sediment control and the retention and re-spreading of topsoil will be implemented, and thus soil quality is unlikely to be affected outside of the immediate surface disturbance area.

c) clears or modifies native vegetation;

The proposed activity will involve the clearing of approximately 14.3 ha of native vegetation. It would also result in the modification of a patch of native vegetation, which extends to north of the site by reducing its size by approximately 1 ha.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

Areas of vegetation clearance will in the long-term be rehabilitated using existing topsoil. Sowing soil stockpiles with a sterile cover crop is implemented to manage weeds at the site. As such an increase in weeds is not expected.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

NA for the listed flora species.

f) affects natural revegetation and recolonisation of existing species following disturbance.

The proposed activity would have a minor impact on the ability of these plant species to recolonise following disturbance by reducing the overall amount of available habitat and the overall amount of potential propagules in the soil seed bank.

iii) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

These three threatened flora species have broad, patchy distributions (DECC, 2008b). None of these species are at the limit of their geographical range in central west NSW.

iv) How is the proposal likely to affect current disturbance regimes?

a) modifies the intensity and frequency of fires;

Fire regimes are unlikely to change as a result of the proposal.

b) modifies flooding flows;

The proposed activity will involve a reconfiguration of local drainage control works to incorporate the proposed infrastructure. NPM would continue to operate as a zero-discharge site consistent with the current surface water management system (Corkery and Associates, 2006). The proposed activity will not modify flooding flows outside the site nor impact on any natural flood regimes in the locality.

v) How is the proposal likely to effect habitat connectivity?

a) creates a barrier to fauna movement;

b) removes remnant vegetation or wildlife corridors; and

c) modifies remnant vegetation or wildlife corridors.

The proposed activity will remove the only vegetated wildlife corridor into the s.75 modification area.

Beyond the boundaries of the site, the proposal will not create any barrier to remnant vegetation and will not modify any remnant vegetation. No potential habitat outside the site will become isolated or fragmented as a result of the proposal. The proposal will not remove any vegetation corridors or disconnect any vegetation around the site. The site will be rehabilitated after the conclusion of mining activities, soil that had been stockpiled will be resurfaced across the site, and then the area will be replanted with the idea of reconnecting habitat, where practicable across the entire mine site.

vi) How is the proposal likely to affect critical habitat?

- **a) removes or modifies key habitat features;**
- **b) affects natural revegetation or recolonisation of existing species following disturbance**
- **c) introduces weeds, vermin or feral species;**
- **d) generates or disposes of solids, liquid or gaseous waste; or**
- **e) uses pesticide, herbicides, other chemicals.**

No critical habitat listed under legislation occurred in the s.75 modification area or within adjacent areas of vegetation. Targeted surveys both within the areas of clearance and in adjacent areas did not reveal either of these species, and the small area of marginal potential habitat to be removed or modified is not considered to constitute important habitat for these species' conservation in the locality or region.

Conclusion

Based on the above considerations the proposed activity is unlikely to have a significant effect on local populations of the threatened plants *Austrostipa wakoolica, Swainsona sericea* and *Swainsona murrayana*.

Endangered Ecological Communities

Two endangered ecological communities (EECs) listed under the TSC Act are present within the S.75 modification area:

- » White Gum, Yellow Box, Blakely's Red Gum Woodland (Box-gum Woodland); and
- » Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Inland Grey Box Woodland).

Areas of Native Grassland in the s.75 modification area also comprise a TSC Act listed EEC for the purposes of this assessment and are assumed to comprise a form of Inland Grey Box Woodland.

The proposed activity will involve direct clearing of these EECs. These three communities are floristically similar, have overlapping distributions and habitat requirements (DECC, 2008b) and are combined in larger-scale vegetation mapping systems (Sivertson and Metcalfe, 1995). Therefore this assessment is for all three EECs present at the site.

i) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

NA to EECs.

ii) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

- **a) disturbs any permanent, semi permanent or ephemeral water bodies;**

The proposed activity would disturb a number of permanent, semi-permanent or ephemeral water bodies within the surface disturbance area . All of these wetlands are artificial features associated with local alteration of surface drainage by mining activities. These areas do not comprise part of the EECs at the site nor are they suitable habitat for any of the EECs.

b) degrades soil quality;

Measures to contain impacts from construction including sediment control and the retention and re-spreading of topsoil will be implemented, and thus soil quality is unlikely to be affected outside of the immediate surface disturbance area. Moreover, the re-surfacing of the stockpiled soils across the site following the cessation of the mine activities should return the natural soil profile as close as is practicable.

c) clears or modifies native vegetation;

The proposed activity will involve the clearing of approximately 14.3 ha of native vegetation, including:

» A maximum of 1.1 ha of Yellow Box Woodland ;

» A maximum of 8.5 ha of Grey Box Woodland and Native Grassland; and

» A maximum of 4.7 ha of Bimble Box Woodland.

The removal of this vegetation also constitutes a form of modification of other Box woodland in the local area. Clearing at the site would reduce the overall area of potential habitat for recruitment of the EECs and the number of mature individuals supplying pollen or seed material to the local gene pool. The majority of woodland to be cleared occurs as fragmented patches and are subject to ongoing disturbance from mining activities and weed invasion. These patches are likely to only provide a minor contribution to the viability of woodland in the locality and the region.

Clearing within the s.75 modification area would also result in the modification of a patch Inland Grey Box Woodland, which extends to north of the site by reducing its size by approximately 1 ha. This would result in a minor reduction of the viability of the patch as over 20 ha remains and it has good connectivity to other patches via road corridors and regenerating plantings.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposed activity would involve the clearing of native vegetation and replacement with areas of roads, stockpiles, tailings storage facilities and other infrastructure. Native vegetation within the study area featured low to moderate weed infestation in the central potions of patches, with moderate to severe infestations around the margins of patches. All disturbed cleared areas were infested with environmental weeds. Therefore it is likely that areas cleared as part of the proposed activity would become infested with environmental weeds. Sowing soil stockpiles with a sterile cover crop are implemented to manage weeds at the site and would partially mitigate this effect. Most of the areas to be cleared are surrounded by disturbed cleared land and so the proposed activity would have a minor impact on the overall numbers and extent of weed species in the locality. Clearing of 1 ha of vegetation that adjoins a remnant patch in the north of the s.75 modification area would probably result in weed invasion around the new margins of the patch.

Vermin or feral species are not expected to increase and/or spread as a result of the proposal. The proposed activity will not fragment or isolated any habitat nor result in any other changes that are likely to favour feral animals.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

The proposal will remove approximately 14.3 ha of habitat for the EECs, comprising the current extent of native vegetation at the s.75 modification area. This habitat is defined by the presence of fertile soils in the lower parts of the landscape with an intact soil seed bank. These types of landscapes have been extensively cleared throughout central NSW (DECC, 2008b,c,d; Sivertson and Metcalfe, 1995) and so any remaining areas may be considered 'key' habitat for these EECs.

The remainder of the s.75 modification area is disturbed cleared land where the original topsoil has been removed and environmental weeds dominate the vegetation cover. These areas do not qualify as potential or key habitat for the EECs.

f) affects natural revegetation and recolonisation of existing species following disturbance.

The proposed activity would effect the ability of these EECs to recolonise following disturbance by reducing the overall amount of available habitat and the overall amount of potential propagules in the soil seed bank. The magnitude of this effect on remaining local populations of these EECs is likely to be minor as the majority of vegetation to be cleared is currently isolated by disturbed cleared land and heavily degraded.

All natural revegetation and recolonisation will be prevented by the removal and disturbance of the soil profile of the entire subject site. Rehabilitation of the area following the cessation of mining activities will see the re-surfacing of the local soil profile and replanting of overstorey and understorey species. This should help promote the recolonisaton of other endemic species.

iii) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

None of the three EECs are at the limit of their known distribution.

iv) How is the proposal likely to affect current disturbance regimes?

a) modifies the intensity and frequency of fires;

As all native vegetation will be removed from the s.75 modification area it is unlikely that:

a. Fire regimes will change as a result of the proposed activity; and

b. Areas of extant EEC outside the development lands will be impacted by altered fire regimes.

b) modifies flooding flows;

The proposed activity will involve a reconfiguration of local drainage control works to incorporate the proposed infrastructure. The Northparkes Mine will continue to operate as a zero-discharge site consistent with the current surface water management system (Corkery and Associates, 2006). The proposed activity will not modify flooding flows outside the study area nor impact on any natural flood regimes in the locality.

v) How is the proposal likely to effect habitat connectivity?

a) creates a barrier to fauna movement;

b) removes remnant vegetation or wildlife corridors; and

c) modifies remnant vegetation or wildlife corridors.

a) The proposed activity will remove the only vegetated wildlife corridor within the s.75 modification area. Beyond the boundaries of the site, the proposed activity will create a barrier to movement of all but the most mobile fauna species. It will affect north-south fauna movement in the locality via remnant vegetation patches. However the clearing would have a minor effect on connectivity around the site since the habitat to be removed is the southern end of the remnant vegetation patches. The habitat to be removed is a ‘dead end’ as fauna movement to the east, west and farther south is already limited by existing mining operations.

b) The proposed activity will remove approximately 14.3 ha of native vegetation. This vegetation is not an important wildlife corridor as the area to be cleared is a dead end, as described above. No habitat will become isolated or fragmented as a result of the proposed activity.

c) The proposed activity will remove vegetation and wildlife corridors within the s.75 modification area, therefore will not isolate any vegetation or wildlife corridors. Moreover, it is unlikely to impact potential corridors outside the surface disturbance area. There is an important east-west wildlife corridor around the site, which lies immediately to the north of the site. The proposal will remove 1 ha of remnant vegetation directly joined to this wildlife corridor, which would result in a minor modification by reducing the overall extent of the habitat. However this clearing is at the edge of the corridor and would not isolate or disconnect any vegetation or otherwise impact on fauna movements through the corridor.

vi) How is the proposal likely to affect critical habitat?

No critical habitat listed under legislation occurred in the study area or within adjacent areas of vegetation.

Conclusion

The proposed activity would involve the clearing of approximately 14.3 ha, in total, of the three EECs considered in this assessment. This is a relatively minor extent of the three EECs based on the area of remnant vegetation in the locality. Further, the patches of vegetation are small in extent and surrounded by disturbed cleared land. The clearing of these areas would have a minor effect on the viability of the EECs in the locality. Based on the above considerations the proposed activity is not likely to have a significant adverse effect on local populations of the EECs Box-gum Woodland, Inland Grey Box Woodland or Box Woodland Derived Native Grassland.

Moreover, the proposed rehabilitation of the site following cessation of the mining activities would return the s.75 modification area to a condition that is likely to comprise future habitat for the EEC.

Threatened Fauna

9.1.1 Grey-crowned Babbler

i) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

a) displaces or disturbs threatened species and/or populations;

The proposed activity would disturb and/or displace a local family group of Grey-crowned Babblers. The proposed activity would involve the clearing of approximately 14.3 ha of habitat for the species in native vegetation within the s.75 modification area. Between three and five individual Grey-crowned Babblers were observed in this habitat over the survey period indicating that the habitat to be removed comprises part of the territory of a local population. It is not possible to determine from the GHD (2008) surveys how large the home range of the group is and therefore it is not possible to determine what proportion of habitat in this range would be removed. The proposed activity would disturb the species, through the removal of 14.3 ha of habitat and direct interference during construction and operation at the site. This clearing may displace completely the species if it means that the remaining area of habitat is not large enough to support a viable local population. The DECC (2008b) threatened species profile for the species notes that "territories range from one to fifty hectares (usually around ten hectares)".

b) disrupts breeding cycle;

No evidence of breeding activity was observed in the surface disturbance area for the proposed activity. A Grey-crowned Babbler nest was noted in woodland to the north of the s.75 modification area. The species builds and maintains a group of nests and so it is likely that the remaining nests, and the core breeding habitat for this group of babblers, is elsewhere in this patch of woodland. The proposed activity may interfere with the breeding cycle of the Grey-crowned Babbler by reducing the area of foraging habitat in their territory. This may limit the amount of food available at critical stages in the breeding cycle of the species.

c) disturbs the dormancy period;

The Grey-crowned Babbler is active year round and so this factor is not relevant to this assessment.

d) disrupts roosting behaviour;

The Grey-crowned Babbler roosts in a group of communal nests that are maintained year round (DECC, 2008b). None of these nests were observed in the proposed surface disturbance area. A pre-clearance survey, targeting babbler nests is recommended as part of the environmental management measures for the s.75 modification area prior to approved vegetation clearance activities.

Since the Grey-crowned Babbler persists in the area in the vicinity of ongoing mining activities it may be assumed that noise, lighting and other disturbances do not have a significant adverse effect on roosting behaviour for this species.

e) changes foraging behaviour;

The proposed activity would change foraging behaviour of the local population of the Grey-crowned Babbler by removing 14.3 ha of foraging habitat. The species would have to concentrate their time and effort in alternative habitat to compensate for this loss of resources. This may require the local population to expand their territory, which may lead to conflict with other groups of babblers, increase the risk of predation or reduce foraging efficiency.

f) affects migration and dispersal ability;

The proposal will affect the migration and dispersal ability of the Grey-crowned Babbler by clearing 14.3 ha of habitat. Habitat fragmentation is considered a threat to the species as it is often reported as being unable to traverse large clearings (DECC, 2008b). Personal observation suggests that this may be overemphasized in the literature, including the results of the present study. Grey-crowned Babblers were observed in woodland patches in the southern portions of the s.75 modification area, which are surrounded by disturbed cleared land. Nonetheless, it is likely that the proposed surface disturbance area in conjunction with the operating portions of NPM would comprise a complete barrier to dispersal of the species through the s.75 modification area.

The magnitude of this effect is likely to be reduced as the habitat to be removed is at the southern extreme of a patch of habitat for the species that already represents a ‘dead end’ for movement further south, east or west.

g) disrupts pollination cycle;

NA for listed fauna species.

h) disturbs seedbanks;

NA for listed fauna species.

i) disrupts recruitment (i.e. germination and establishment of plants);

NA for listed fauna species.

j) affects the interaction between threatened species and other species in the community (eg. Pollinators, host species, microrrhizal associations).

The proposed activity is likely to affect interactions between the Grey-crowned Babbler and other species in the community. There are no positive interspecific relations reported for the Grey-crowned Babbler. However, a number of negative relationships are known, including competition with the Noisy Miner and predation by ravens and currawongs (DECC, 2008b). These competitors are favoured by disturbance and habitat fragmentation and are known to have negative impacts on other bird species in modified environments (BIBY, 2008; Reid 1999). The proposed activity may increase the negative effect of these interactions by reducing the extent of intact habitat (and hence shelter) for the Grey-crowned Babbler and by favouring local populations of the Noisy Miner and ravens.

ii) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

a) disturbs any permanent, semi permanent or ephemeral water bodies;

The proposal will disturb a number of water bodies that may provide water for the Grey-crowned Babbler. this would have a minor effect as the water bodies are all artificial and large numbers of alternative water sources will be retained in the locality, outside of the proposed clearing areas.

b) degrades soil quality;

Impacts within the proposed surface disturbance area are addressed in c), below. Measures to contain impacts from construction including sediment control and the retention and re-spreading of topsoil will be implemented, and thus soil quality is unlikely to be affected outside this area.

c) clears or modifies native vegetation;

The proposed activity will remove approximately 14.3 ha of native vegetation.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposed activity would involve the clearing of native vegetation and replacement with areas of roads, stockpiles, tailings storage facilities and other infrastructure. Native vegetation within the study area featured low to moderate weed infestation in the central potions of patches, with moderate to severe infestations around the margins of patches. All disturbed cleared areas were infested with environmental weeds. Therefore it is likely that areas cleared as part of the proposed activity would become infested with environmental weeds. Sowing soil stockpiles with a sterile cover crop is implemented to manage weeds at the site and would partially mitigate this effect. Most of the areas to be cleared are surrounded by disturbed cleared land and so the proposed activity would have a minor impact on the overall numbers and extent of weed species in the locality. Clearing of 1 ha of vegetation that adjoins a remnant patch in the north of the s.75 modification area would probably result in weed invasion around the new margins of the patch.

Vermin or feral species are not expected to increase and/or spread as a result of the proposal. The proposed activity will not fragment or isolated any habitat nor result in any other changes that are likely to greatly favour feral animals.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

The proposal will remove approximately 14.3 ha of foraging habitat for the Grey-crowned Babbler.

f) affects natural revegetation and recolonisation of existing species following disturbance.

The proposed activity may affect the ability of the Grey-crowned Babbler to recolonise following disturbance by reducing the overall amount of available habitat. The magnitude of this effect on the local populations is likely to be minor as the majority of vegetation to be cleared is isolated by disturbed cleared land.

iii) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The study area is not at the limit of the known distribution of the Grey-crowned Babbler.

iv) How is the proposal likely to affect current disturbance regimes?

a) modifies the intensity and frequency of fires;

Fire regimes are unlikely to change as a result of the proposed activity.

b) modifies flooding flows;

The proposed activity will involve a reconfiguration of local drainage control works to incorporate the proposed infrastructure. NPM will continue to operate as a zero-discharge site consistent with the current surface water management system (Corkery and Associates, 2006). The proposed activity will not modify flooding flows outside the site nor impact on any natural flood regimes in the locality.

v) How is the proposal likely to effect habitat connectivity?

a) creates a barrier to fauna movement;

b) removes remnant vegetation or wildlife corridors; and

c) modifies remnant vegetation or wildlife corridors.

The proposed activity will contribute to a barrier to movement of the Grey-crowned Babbler in the locality. The NPM site would probably constitute a barrier to the north-south movement of the species. It is not clear how significant an effect this barrier would have on local populations of the Grey-crowned Babbler as the extent of their territory is not known. The habitat to be removed is a 'dead end' as fauna movement to the east, west and farther south is already limited by existing mining operations.

b) The proposed activity will remove approximately 14.3 ha of native vegetation. This would remove a locally important wildlife corridor for the Grey-crowned Babbler as this vegetated corridor provides access to approximately 14.3 ha of habitat within the s.75 modification area.

This vegetation would probably not comprise an important wildlife corridor at a regional scale as the area to be cleared is a dead end, as described above. No additional habitat outside the s.75 modification area will become isolated or fragmented as a result of the proposed activity.

c) The proposal will not isolate any vegetation or wildlife corridors outside the surface disturbance area. There is an important east-west wildlife corridor immediately to the north of the s.75 modification area. The proposal will remove 1 ha of remnant vegetation directly joined to this wildlife corridor which would result in a minor modification by reducing the overall extent of the habitat. However this clearing is at the edge of the corridor and would not isolate or disconnect any vegetation or otherwise impact on fauna movements through the corridor.

vi) How is the proposal likely to affect critical habitat?

No critical habitat listed under legislation occurred in the s.75 modification area or within adjacent areas of vegetation.

Conclusion

The proposed activity would involve the clearing of approximately 14.3 ha of habitat for the Grey-crowned Babbler. The results of the GHD (2008) field surveys suggest that this area falls within the territory of a local family group of Grey-crowned Babblers. The total size of this territory and the relative importance of the 14.3 ha to be removed is unclear. The DECC (2008b) profile for the species notes: "territories range from one to fifty hectares (usually around ten hectares)". Grey-crowned Babblers were observed outside the proposed surface disturbance area and so it is unlikely that the local territory falls entirely within the s.75 modification area. Nonetheless, based on the DECC (2008b) estimates the proposed activity would remove a minimum of 30% of the habitat likely to fall within this territory. It is not possible to say with certainty that sufficient alternative habitat exists in the local area. The local population would be displaced from this area of habitat and would potentially experience increased competition, increased predation and shortages of foraging habitat and other important resources. In combination these negative effects are likely to threaten the survival of the species in the locality. Therefore it is likely that the proposed activity will have a significant negative effect on the local population of the Grey-crowned Babbler.

9.1.2 Superb Parrot

i) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

a) displaces or disturbs threatened species and/or populations;

No individual Superb Parrots (*Polytelis swainsonii*) were recorded during the present study. However the species was recorded within 3km of the site in 2006 (RW Corkery, 2006) and approximately one km to the south of the s.75 modification area in December 2007 (GHD, 2007). The GHD (2007) survey recorded up to 15 adults and a recently fledged juvenile. It is not clear whether these records represents evidence of breeding activity or whether these individuals would have bred in core breeding habitat elsewhere and migrated to the site to exploit foraging resources. The nearest known breeding population is in the south west slopes of NSW in area south of Cowra and Grenfell, approximately 100 km to the south of the site (Webster, 1988). This population is thought to breed in tree-hollows in White Box Woodland and then migrate north to forage after their young have fledged (DECC, 2008b; Webster, 1988). GHD (2008) targeted surveys during the breeding season for the Superb Parrot did not record the species on or in the vicinity of the site. Therefore it is likely that the s.75 modification area provides foraging, but not breeding habitat for the species.

The proposed activity would involve the clearing of approximately 14.3 ha of foraging habitat for the species in native vegetation within the s.75 modification area. This would disturb the species, through the removal of 14.3 ha of habitat and direct interference during construction and operation at the site. This clearing is unlikely to displace the species from the local area as Superb Parrots will travel large distances to exploit seasonal foraging resources (DECC, 2008b; Webster 1988). There are alternative foraging resources for the species in the locality, including remnant vegetation in the Limestone National Forest to the south and along travelling stock routes.

b) disrupts breeding cycle;

There are three main identified breeding populations of the Superb Parrot: one along the Murray River in the Central Riverina; a second along the Murrumbidgee; and a third south western slopes population in an area roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west (DECC, 2008b; Webster, 1988). The south western slopes population migrates north outside the breeding season to forage in Box Woodlands throughout the Central Western Slopes and Plains of NSW. Based on the locations of known breeding populations (DECC, 2008a,b) it is assumed that the observations of Superb Parrots within the study area would probably have been of foraging individuals outside the breeding season. It is likely that the proposed activity would impact on foraging habitat for the species, outside of the breeding season and so would not disrupt the breeding cycle of the Superb Parrot.

c) disturbs the dormancy period;

The Superb Parrot is active year round and so this factor is not relevant to this assessment.

d) disrupts roosting behaviour;

The Superb Parrot is not known to breed in the Parkes region and so the proposal is unlikely to remove any important roosting or nesting sites (DECC, 2008b). The Superb Parrot may occasionally occupy nocturnal roost sites within the s.75 modification area whilst foraging in the local area. The proposed activity may affect this roosting behaviour by removing potential roost sites in the 14.3 ha of native vegetation that will be cleared. This is likely to have a minor effect on the species as there are ample alternative roost sites in woodland elsewhere in the locality. The patches of Box-Gum may also represent an important ‘re-fuelling’ resource for the species as it migrates across the region to other larger fragments and foraging resources.

e) changes foraging behaviour;

The proposed activity would probably change foraging behaviour of the Superb Parrot by removing 14.3 ha of foraging habitat. The species would have to concentrate their time and effort in alternative habitat to compensate for this loss of resources. The parrot is highly mobile species and is able to traverse large open areas between patches of foraging and nesting habitat. The loss of a relatively small patch considering the patches that occur within the wider locality is probably of minor importance to local populations of the species.

f) affects migration and dispersal ability;

The Superb Parrot is a large, mobile species, which routinely traverses agricultural land and other clearings to exploit foraging resources. The Superb Parrot would rely on ‘stepping stones’ of suitable foraging and roosting habitat during migrations. By removing 14.3 ha of habitat the proposed activity would increase the distance between suitable patches. In a regional context this would probably comprise a minor effect on the species given the presence of other remnant patches of Box woodland. Thus the proposed activity is unlikely to affect this dispersal ability.

g) disrupts pollination cycle;

NA for listed fauna species.

h) disturbs seedbanks;

NA for listed fauna species.

i) disrupts recruitment (i.e. germination and establishment of plants);

NA for listed fauna species.

j) affects the interaction between threatened species and other species in the community (eg. Pollinators, host species, microrrhizal associations).

The proposed activity is unlikely to affect interactions between the Superb Parrots and any other species in the community.

ii) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

a) disturbs any permanent, semi permanent or ephemeral water bodies;

The proposal will disturb a number of water bodies that may provide water for the Superb Parrot. This would have a minor effect as the water bodies are all artificial and large numbers of alternative water sources will be retained in the locality.

b) degrades soil quality;

Impacts within the proposed surface disturbance area are addressed in c), below. Measures to contain impacts from construction including sediment control and the retention and re-spreading of topsoil will be implemented, and thus soil quality is unlikely to be affected outside this area.

c) clears or modifies native vegetation;

The proposed activity will remove 14.3 ha of native vegetation.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposed activity would involve the clearing of native vegetation and replacement with areas of roads, stockpiles, tailings storage facilities and other infrastructure. Native vegetation within the study area featured low to moderate weed infestation in the central portions of patches, with moderate to severe infestations around the margins of patches. All disturbed cleared areas were infested with environmental weeds. Therefore it is likely that areas cleared as part of the proposed activity would become infested with environmental weeds. Sowing soil stockpiles with a sterile cover crop is implemented to manage weeds at the site and would partially mitigate this effect. Most of the areas to be cleared are surrounded by disturbed cleared land and so the proposed activity would have a minor impact on the overall numbers and extent of weed species in the locality. Clearing of 1 ha of vegetation that adjoins a remnant patch in the north of the s.75 modification area would probably result in weed invasion around the new margins of the patch.

Vermin or feral species are not expected to increase and/or spread as a result of the proposal. The proposed activity will not fragment or isolated any habitat nor result in any other changes that are likely to favour feral animals.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

The proposal will remove approximately 14.3 ha of foraging habitat for the Superb Parrot.

f) affects natural revegetation and recolonisation of existing species following disturbance.

The proposed activity may affect the ability of the Superb Parrot to recolonise following disturbance by reducing the overall amount of available habitat. The magnitude of this effect on the local populations is likely to be minor as the species is highly mobile and will travel large distances to exploit seasonal foraging resources.

iii) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The study area is not at the limit of the known distribution of the Superb Parrot, in terms of its known foraging range. However, if the fledgeling observed in the GHD (2007) pre-clearing survey is indicative of a local breeding population then this would be the northernmost known breeding population. This would extend the breeding range of the species by approximately 100 km (Webster, 1988; DECC, 2008b).

iv) How is the proposal likely to affect current disturbance regimes?

a) modifies the intensity and frequency of fires;

Fire regimes are unlikely to change as a result of the proposed activity.

b) modifies flooding flows;

The proposed activity will involve a reconfiguration of local drainage control works to incorporate the proposed infrastructure. The Northparkes Mine will continue to operate as a zero-discharge site consistent with the current surface water management system (Corkery and Associates, 2006). The proposed activity will not modify flooding flows outside the site nor impact on any natural flood regimes in the locality.

v) How is the proposal likely to effect habitat connectivity?

a) creates a barrier to fauna movement;

b) removes remnant vegetation or wildlife corridors; and

c) modifies remnant vegetation or wildlife corridors.

a) The s.75 modification area and NPM may together result in a barrier to movement of the Superb Parrot in the locality by increasing the area of non-viable habitat the species has to traverse. Although the Superb Parrot is highly mobile it would rely on 'stepping stones' of suitable foraging and roosting habitat during migrations. By removing 14.3 ha of habitat the proposed activity would increase the distance between suitable patches. In a regional context this would probably comprise a minor effect on the species given the presence of other remnant patches of Box woodland.

b) The proposed activity will remove approximately 14.3 ha of remnant vegetation, which will completely remove the wildlife corridor into the s.75 modification area. This vegetation is not an important wildlife corridor for the Superb Parrot as it is able to traverse cleared land. However it may have value as a 'stepping stone' as described above. No additional habitat outside the s.75 modification area will become isolated or fragmented as a result of the proposed activity.

c) The proposal will not isolate any vegetation or wildlife corridors outside the surface disturbance area. There is an important east-west wildlife corridor immediately to the north of the s.75 modification area. The proposal will remove 1 ha of remnant vegetation directly joined to this wildlife corridor, which would result in a minor modification by reducing the overall extent of the habitat. However this clearing is at the edge of the corridor and would not isolate or disconnect any vegetation or otherwise impact on fauna movements through the corridor.

vi) How is the proposal likely to affect critical habitat?

No critical habitat listed under legislation occurred in the s.75 modification area or within adjacent areas of vegetation.

Conclusion

The proposed activity would involve the clearing of approximately 14.3 ha of foraging habitat for the Superb Parrot. The Superb Parrot traverses large distances to exploit seasonal foraging resources and so it is unlikely that the proposed activity will have a significant negative effect on the local, seasonal population of the Superb Parrot.

9.1.3 Yellow-bellied Sheathtail Bat

i) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

a) displaces or disturbs threatened species and/or populations;

The Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) was not recorded during the field investigations. It was recorded in the immediate vicinity of the site during Corkery and Co (2006) field surveys and is likely to occur within the s.75 modification area given the habitats present. The proposed activity would disturb and/or displace any individuals roosting in the 14.3 ha of native vegetation to be removed. A pre-clearing survey is proposed prior to removal of habitat. This would help minimise impacts on any Yellow-bellied Sheathtail Bats or other microbats which may potentially occupy the s.75 modification area.

b) disrupts breeding cycle;

Factors likely to disrupt the life cycle of the Yellow-bellied Sheathtail Bat are loss of roost trees, particularly when significant numbers of individuals are present, as is the case when females congregate at maternity roosts, and loss of significant areas of foraging habitat. The proposed activity will remove 45 hollow-bearing trees, which comprise potential maternity roost sites for the species.

c) disturbs the dormancy period;

The Yellow-bellied Sheathtail Bat, and other microbat species, utilise tree hollows and other shelter during an annual cool-season dormancy period. The proposed activity would remove potential dormancy roost sites in the 14.3 ha of native vegetation to be removed, including approximately 45 hollow-bearing trees. This would disturb the dormancy period of any individuals of this species potentially roosting on s.75 modification area during the construction period. The proposed activity is unlikely to disturb the Yellow-bellied Sheathtail Bat or any other microbat species outside the proposed surface disturbance area.

d) disrupts roosting behaviour;

The proposed activity would remove potential roost sites in the 14.3 ha of native vegetation to be removed, including approximately 45 hollow-bearing trees. These hollow bearing trees would provide diurnal roost sites and potential maternity colony sites for the Yellow-bellied Sheathtail Bat.

The proposed activity may disrupt potential roosting activity in areas of remnant vegetation adjacent to the s.75 modification area through noise and other disturbance. Fauna potentially occupying these areas would be adapted to disturbance from the existing NPM operations. In this context additional effects associated with the modification would be relatively minor.

e) changes foraging behaviour;

The proposed activity may change the foraging behaviour of the Yellow-bellied Sheathtail Bat by removing 14.3 ha of potential foraging habitat. The species would have to utilise alternative habitat to compensate for this loss of resources.

f) affects migration and dispersal ability;

The Yellow-bellied Sheathtail Bat is highly mobile and so the proposed activity is unlikely to create a direct barrier to the movement of the species. The vegetation to be removed may have value as ‘stepping stone’ habitat for the Yellow-bellied Sheathtail Bat. This may increase the distance the species has to traverse between viable patches of habitat, however this would have a relatively effect on its migration and dispersal ability.

g) disrupts pollination cycle;

NA for listed fauna species.

h) disturbs seedbanks;

NA for listed fauna species.

i) disrupts recruitment (i.e. germination and establishment of plants);

NA for listed fauna species.

j) affects the interaction between threatened species and other species in the community (eg. Pollinators, host species, microrrhizal associations).

The proposed activity is unlikely to have any significant effects on interactions between Yellow-bellied Sheathtail Bat and other organisms in the community.

ii) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

a) disturbs any permanent, semi permanent or ephemeral water bodies;

The proposed activity would disturb a number of permanent, semi-permanent or ephemeral water bodies. All of the wetlands within the surface disturbance area are artificial features associated with local alteration of surface drainage by mining activities. These water bodies would have value to the Yellow-bellied Sheathtail Bat as water sources and as foraging habitat, since prey insects are often concentrated above water bodies. Construction associated with the proposed activity would result in a similar amount of artificial wetlands and an equivalent amount of potential habitat for the species. Changes to these water bodies as a result of the proposed activity are unlikely to have a significant effect on the Yellow-bellied Sheathtail Bat.

b) degrades soil quality;

Impacts within the proposed surface disturbance area are addressed in c), below. Measures to contain impacts from construction including sediment control and the retention and re-spreading of topsoil will be implemented, and thus soil quality is unlikely to be affected outside this area.

c) clears or modifies native vegetation;

The proposed activity will remove 14.3 ha of native vegetation.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposed activity would involve the clearing of native vegetation and replacement with areas of roads, stockpiles, tailings storage facilities and other infrastructure. Native vegetation within the study area featured low to moderate weed infestation in the central potions of patches, with moderate to severe infestations around the margins of patches. All disturbed cleared areas were infested with environmental weeds. Therefore it is likely that areas cleared as part of the proposed activity would become infested with environmental weeds. Sowing soil stockpiles with a sterile cover crop is implemented to manage weeds at the site and would partially mitigate this effect. Most of the areas to be cleared are surrounded by disturbed cleared land and so the proposed activity would have a minor impact on the overall numbers and extent of weed species in the locality. Clearing of 1 ha of vegetation that adjoins a remnant patch in the north of the s.75 modification area would probably result in weed invasion around the new margins of the patch.

Vermin or feral species are not expected to increase and/or spread as a result of the proposal. The proposed activity will not fragment or isolated any habitat nor result in any other changes that are likely to favour feral animals.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

The proposal will remove approximately 14.3 ha of foraging habitat for the Yellow-bellied Sheathtail Bat in native vegetation to be cleared. It will also remove approximately 45 hollow bearing trees which comprise diurnal roost sites and potentially maternity colony sites. Mature trees throughout native vegetation within the s.75 modification area would provide further roost sites in smaller cracks and fissures and beneath flaking bark.

f) affects natural revegetation and recolonisation of existing species following disturbance.

The proposed activity may affect the ability of the Yellow-bellied Sheathtail Bat to recolonise following disturbance by reducing the overall amount of available habitat. The magnitude of this effect on the local populations is likely to be minor as the species is highly mobile and will travel large distances to exploit seasonal foraging resources.

iii) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The study area is not at the limit of the known distribution of the Yellow-bellied Sheathtail Bat.

iv) How is the proposal likely to affect current disturbance regimes?

a) modifies the intensity and frequency of fires;

Fire regimes are unlikely to change as a result of the proposed activity.

b) modifies flooding flows;

The proposed activity will involve a reconfiguration of local drainage control works to incorporate the proposed infrastructure. The NPM will continue to operate as a zero-discharge site consistent with the current surface water management system (Corkery and Associates, 2006). The proposed activity will not modify flooding flows outside the site nor impact on any natural flood regimes in the locality.

v) How is the proposal likely to effect habitat connectivity?

a) creates a barrier to fauna movement;

b) removes remnant vegetation or wildlife corridors; and

c) modifies remnant vegetation or wildlife corridors.

a) The proposed activity is unlikely to create a barrier to movement of the Yellow-bellied Sheathtail Bat in the locality. While, the modified Northparkes Mine area would constitute a partial barrier to movement of the species in the locality by increasing the area of non-viable habitat the species has to traverse, the Yellow-bellied Sheathtail Bat is highly mobile it would rely on 'stepping stones' of suitable foraging and roosting habitat during migrations. By removing 14.3 ha of habitat the proposed activity would increase the distance between suitable patches. In a regional context this would probably comprise a minor effect on the species.

b) The proposed activity will remove approximately 14.3 ha of remnant vegetation. This would not have comprised a wildlife corridor for this species as it is able to traverse cleared land. No additional habitat outside the s.75 modification area will become isolated or fragmented as a result of the proposed activity.

c) The proposed activity will remove the only vegetated wildlife corridor into the s.75 modification area. The proposed activity will not isolate any vegetation or wildlife corridors outside the surface disturbance area. There is an important east-west wildlife corridor immediately to the north of the s.75 modification area. The proposal will remove 1 ha of remnant vegetation directly joined to this wildlife corridor which would result in a minor modification by reducing the overall extent of the habitat. However this clearing is at the edge of the corridor and would not isolate or disconnect any vegetation or otherwise impact on fauna movements through the corridor.

vi) How is the proposal likely to affect critical habitat?

No critical habitat listed under legislation occurred in the s.75 modification area or within adjacent areas of vegetation.

Conclusion

The proposed activity would involve the clearing of approximately 14.3 ha of foraging habitat for Yellow-bellied Sheathtail Bat . The proposal will also remove 45 hollow bearing trees which may provide important diurnal roost sites and potentially maternity colony sites for the species. Much of the native vegetation in the study area is immature regrowth or visual screening plantings. These areas do not contain mature trees and would not provide alternative breeding or roosting resources for the species. While the area of potential roosting habitat lost as part of the proposal will reduce habitat for this species there is likely to be sufficient alternative resources in the locality to maintain local populations.

Moreover, the proposed rehabilitation of the site following cessation of the mining activities would return the s.75 modification area to a condition that is likely to comprise future habitat for the species. Therefore the proposed activity is unlikely to have a significant effect on local populations of the Yellow-bellied Sheathtail Bat.

Appendix E

EPBC Act Assessment of Significance

Approach

Pursuant to the EPBC Act, an assessment of potential impacts arising from the proposal on matters of NES must be undertaken. If the assessment concludes that a significant impact is likely then a referral to the Minister of DEWHA must be made. This assessment is provided consistent with *EPBC Act Policy Statement 1.1 - Significant Impact Guidelines Matters of National Environmental Significance* (DEH 2006). The DEH (2006) guidelines require proponents (or their representatives) to perform a 'self-assessment' to decide whether or not the proposed action is likely to have a significant impact on any matters of NES. Consideration of matters of NES is provided in Section 6.2. Where impacts on a matter of NES are likely then an assessment of the significance of those impacts must be performed.

The proposed activity will remove habitat for EPBC Act listed biota, which comprises an impact on a matter of NES. A detailed assessment of the significance of these impacts on threatened species, populations and endangered ecological communities is provided below.

Flora

There is potential habitat for two EPBC Act listed flora species within the s.75 modification area:

» *Austrostipa wakoolica* (A Spear-grass)

» *Swainsona murrayana (*Slender Darling Pea*)*

Suitable habitat for these species is present in woodland and derived native grassland within the s.75 modification area. Although these species were not detected during field surveys threatened plants may colonise habitat at the site in the future or may exist in the soil seed bank or as dormant individuals. They are very unlikely to occur in disturbed land within the s.75 modification area due to historic removal and modification of the soil seed bank and ongoing competition from exotic species.

The significance of adverse impacts on these species and their habitats is assessed below.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of a population

The proposed activity is unlikely to result in a long-term decrease in the size of a population, should it occur, as no individuals were recorded at the s.75 modification area nor have they been previously recorded within the locality. The proposed activity will remove potential habitat for local populations of *Austrostipa wakoolica* and/or *Swainsona murrayana*. The habitat to be removed is limited in extent, patchy and subject to ongoing disturbing activities and weed invasion. It is unlikely to be important to populations of these species. It is likely that sufficient alternative habitat exists within the study area and locality to maintain local populations, should they occur.

Reduce the area of occupancy of the species

No individuals were recorded at the s.75 modification area nor have they been previously recorded within the locality. As such, the proposal is unlikely to result in the area of occupancy for this species.

Fragment an existing population into two or more populations

No populations of these plant species are known from the study area. The habitat to be removed is at the edge of a patch of potential habitat for the species. The proposed activity will not split or otherwise isolate any areas of habitat for populations of *Austrostipa wakoolica* and/or *Swainsona murrayana*. Therefore the proposal is unlikely to result in any existing population being fragmented into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat listed under legislation occurred in the s.75 modification area or within adjacent areas of vegetation. The habitat to be removed is limited in extent, patchy and subject to ongoing disturbing activities and weed invasion. Therefore the habitat to be removed is unlikely to be important or critical habitat for this species.

Disrupt the breeding cycle of a population

As a grass *Austrostipa wakoolica* relies on the wind to disperse its pollen. The proposed activity will not remove any adult individuals, isolate any areas of habitat from the wind or otherwise disrupt the breeding cycle of *A. wakoolica* or any other native grasses.

Information on pollinators for S*wainsona murrayan* species was not available. As a member of the Family Fabaceae Subf. Faboides it probably relies on bees or similarly sized insect pollinators. The proposal will result in the loss of only a small percentage of the habitat for potential pollinators from the surrounding region and would have a minor effect on their overall population. Vegetation retained in the locality will not be isolated by the proposal, and will not create any barriers within the landscape. As such the proposal is unlikely to disrupt the breeding cycle of these species.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposed activity would remove 14.3 ha of potential habitat for *Austrostipa wakoolica* and *Swainsona murrayana*. Neither species has been recorded within the locality and so there is no direct evidence that habitat at the s.75 modification area is important for connecting local populations or allowing for germination or recruitment. It is unlikely that habitat at the s.75 modification area would be important for the maintenance of local populations as it is surrounded by areas of disturbed cleared land. The proposed activity would have a minor impact by reducing the overall area of potential habitat that these species could potentially colonise in the future. This is unlikely to cause either species to decline.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed activity would probably increase the numbers of invasive weed species in the surface disturbance area*.* Once this area has been cleared it would no longer constitute habitat for threatened plant species and so this consideration is not relevant to this area. The proposed activity is likely to increase the degree of weed invasion in intact vegetation adjacent to the s.75 modification area, which would constitute threatened species habitat. Observation of the study area during GHD (2008) field surveys suggest that this impact would be confined to the margins of this vegetation, immediately adjacent to the proposed surface disturbance area. This would result in a minor increase in the area of threatened species habitat affected by weed invasion.

Introduce disease that may cause the species to decline

There is the potential for the proposed construction works to introduce *Phytophthera cinnamomi* into the study area. Measures to control *Phytophthora cinnamomi* should be developed and implemented and hygiene measures to prevent the introduction or spread of the pathogen during the construction and operational phases of the development incorporated into any CEMP for the site. Vehicle movements would be restricted to the surface disturbance area for the proposed activity. Therefore the proposed activity is unlikely to result in the introduction of disease that may cause threatened species to decline.

Interfere with the recovery of the species

The habitat to be removed by the proposed activity is patchy and isolated and is unlikely to be important to the recovery of threatened plant species. Therefore the proposal is unlikely to interfere with the recovery of these species.

Conclusion

Consideration of the above assessment criteria concludes that the proposal is unlikely to have a significant impact on populations of *Austrostipa wakoolica* or *Swainsona murrayana*.

Fauna

The EPBC Act listed Vulnerable Superb Parrot (*Polytellis swainsonii*) has been recorded in the immediate vicinity of the s.75 modification area (GHD, 2007). The proposed activity will remove habitat for this species and so an assessment of the significance of impacts on populations of the Superb Parrot is provided below.

There is potential habitat for a number of other EPBC Act listed fauna species at the s.75 modification area. Suitable habitat for these species is present in woodland and derived native grassland at the s.75 modification area. Although these species were not detected during field surveys these species are mobile and occupy the s.75 modification area on an occasional or opportunistic basis. They are very unlikely to occur in disturbed land at the s.75 modification area due to historic removal and modification of the soil seed bank and ongoing competition from exotic species. They may occur in woodland and native grassland at the s.75 modification area on an occasional or opportunistic basis.

The significance of adverse impacts on these species and their habitats is assessed below.

Superb Parrot

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of a population

The proposed activity would involve the clearing of approximately 14.3 ha of foraging habitat for the species in native vegetation at the s.75 modification area. This would disturb the species, through the removal of 14.3 ha of habitat and direct interference during construction and operation at the s.75 modification area. This clearing is unlikely to displace the species from the local area as Superb Parrots will travel large distances to exploit seasonal foraging resources (DECC, 2008b; Webster 1988). There are alternative foraging resources for the species in the locality, including remnant vegetation in the Limestone National Forest to the south and along travelling stock routes and throughout the region. Therefore the removal of resources as a result of the proposed activity is unlikely to cause a decrease in the size of the population.

Reduce the area of occupancy of the species

No individuals were recorded at the s.75 modification area, nor have they previously been recorded in the 14.3 ha of habitat to be removed. There is no evidence to suggest that the habitat to be removed is critical to the occurrence of the species in the locality. The species is likely to persist in woodland remnants in the Limestone National Forest, in woodland patches immediately to the north of the s.75 modification area and in other remnant vegetation in the locality. Therefore the proposed activity is unlikely to reduce the area of occupancy for this species at the locality scale (radius 10km) or the regional scale.

Fragment an existing population into two or more populations

Superb Parrots previously recorded in the locality are probably part of a regional population that breeds in the South Western Slopes of NSW and forages in the study area. This population is highly mobile and traverses large distances between foraging habitat and core breeding habitat (DECC, 2008b, Webster, 1988). The modified Northparkes Mine area would constitute a partial barrier to regional movements of the species by increasing the area of non-viable habitat the species has to traverse. Although the Superb Parrot is highly mobile it would rely on 'stepping stones' of suitable foraging and roosting habitat during migrations. By removing 14.3 ha of habitat the proposed activity would increase the distance between suitable patches. In a regional context this would comprise a minor effect on the species and is unlikely to fragment existing populations.

Adversely affect habitat critical to the survival of a species

No critical habitat listed under legislation occurred in the s.75 modification area or within adjacent areas of vegetation. The habitat to be removed is limited in extent, patchy and subject to ongoing disturbing activities and weed invasion. Therefore the habitat to be removed is unlikely to be important or critical habitat for this species.

Disrupt the breeding cycle of a population

The GHD (2007) survey recorded up to 15 adults and a recently fledged juvenile. It is not clear with these records represents evidence of breeding activity or whether these individuals would have bred in core breeding habitat elsewhere and migrated to the s.75 modification area to exploit foraging resources. The nearest known breeding population is in the south west slopes of NSW in area south of Cowra and Grenfell, approximately 100 km to the south of the s.75 modification area (Webster, 1988). This population is thought to breed in tree-hollows in White Box Woodland and then migrate north to forage after their young have fledged (DECC, 2008b; Webster, 1988). As described above, previous observations of the Superb Parrot in the vicinity of the s.75 modification area are likely to be of birds during their post-breeding dispersal. The proposed activity would only remove foraging resources and will not disrupt the breeding cycle of a local population.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposed activity would involve the clearing of native vegetation and replacement with areas of roads, stockpiles, tailings storage facilities and other infrastructure. This would remove 14.3 ha of foraging habitat for the Superb Parrot. The habitat to be removed is limited in extent, patchy and subject to ongoing disturbing activities. Woodland remnants in the Limestone National Forest, patches immediately to the north of the s.75 modification area and other remnant vegetation in the locality provide alternative resources. Therefore this loss of habitat is unlikely to result in a decline in the species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed activity would probably increase the numbers of invasive weed species in the surface disturbance area. Once this area has been cleared it would no longer constitute habitat for threatened plant species and so this consideration is not relevant to this area. The proposed activity is likely to increase the degree of weed invasion in intact vegetation adjacent to the s.75 modification area, which would constitute threatened species habitat. Observation of the study area during GHD (2008) field surveys suggest that this impact would be confined to the margins of this vegetation, immediately adjacent to the proposed surface disturbance area. This would result in a minor increase in the area of threatened species habitat affected by weed invasion.

Pest fauna species are present at the site and are likely to be prevalent in the surrounding region. the proposed activity is unlikely to affect the abundance of these species in remnant Superb Parrot habitat.

Introduce disease that may cause the species to decline

The Superb Parrot is susceptible to the disease *Psittacine circoviral* (beak & feather) disease (PCD). PCD affects parrots and associated species (psittacines birds), and is often fatal (DECC, 2008e). Construction and operation would be restricted to the surface disturbance area for the proposed activity. The proposed pre-clearance survey would identify any Superb Parrots in the surface disturbance area and limit any contact with individual birds. Further, it is very unlikely that construction equipment or staff would have contacted infected birds outside the s.75 modification area. Therefore the proposed activity is unlikely to result in the introduction of disease that may cause threatened species to decline.

Interfere with the recovery of the species

The habitat to be removed by the proposed activity is patchy and isolated and is unlikely to be important to the recovery of the Superb Parrot. Therefore the proposal is unlikely to interfere with the recovery of this species.

Conclusion

The proposed activity would involve the clearing of approximately 14.3 ha of foraging habitat for the Superb Parrot. The Superb Parrot traverses large distances to exploit seasonal foraging resources and so it is unlikely that the proposed activity will have a significant negative effect on the local, seasonal population of the Superb Parrot.

Mobile threatened fauna

This assessment is for the following mobile, EPBC Act listed fauna species which may occur in habitat at the s.75 modification area from time to time:

» *Lathamus discolor* Swift Parrot

» *Xanthomyza phrygia* Regent Honeyeater

» *Dasyurus maculatus* Spotted-tailed Quoll

» *Nyctophilus timoriensis* (South-eastern form) Eastern Long-eared Bat

An action is likely to have a significant impact on a critically endangered, endangered or vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of a population

The proposed activity is unlikely to result in a long-term decrease in the size of a population, should it occur, as no individuals were recorded at the s.75 modification area nor have they been previously recorded within the locality. The proposed activity will remove potential habitat for local populations of the above listed fauna species. The habitat to be removed is limited in extent, patchy and subject to ongoing disturbing activities. It is unlikely to be important to populations of these species. It is likely that sufficient alternative habitat exists within the study area and locality to maintain local populations, should they occur.

Reduce the area of occupancy of the species

No individuals of the above listed species were recorded at the s.75 modification area nor have they been previously recorded within the locality. As such, the proposal is unlikely to reduce the area of occupancy for these species.

Fragment an existing population into two or more populations

No populations of these mobile fauna species are known from the study area. The proposed activity will completely remove an area of habitat within the proposed surface disturbance area. The habitat to be removed is at the edge of a patch of potential habitat. The s.75 modification area does not act as direct link between any remnant vegetation or other areas of habitat. Therefore the proposed activity will not split or otherwise isolate any areas of habitat for populations of threatened fauna. Therefore the proposal is unlikely to result in any existing population being fragmented into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat listed under legislation occurred in the s.75 modification area or within adjacent areas of vegetation. The habitat to be removed is limited in extent, patchy and subject to ongoing disturbing activities and weed invasion. Therefore the habitat to be removed is unlikely to be important or critical habitat for this species.

Disrupt the breeding cycle of a population

The Swift Parrot and Regent Honeyeater breed well away from the study area but may pass through the s.75 modification area during seasonal migrations (DECC, 2008b). The proposed activity will not create a barrier to the movement of these species. The habitat that will be removed may have some relevance to their breeding cycles by providing foraging resources and acting as a stepping stone during migrations. Areas of woodland retained to the north of the s.75 modification area would provided equivalent resources and so the proposed activity is unlikely to interrupt these cycles.

The s.75 modification area provides marginal foraging habitat for the Spotted-tailed Quoll. It would not provide core breeding or shelter habitat as it is too patchy, open and limited in extent. Therefore the proposed activity is unlikely to have an effect on the breeding cycle of this species.

The s.75 modification area provides foraging and roosting habitat for the Eastern Long-eared Bat and potentially maternity colony s.75 modification areas in hollow-bearing trees. The proposed activity will remove potentially important resources, including approximately 45 hollow-bearing trees.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal will remove approximately 14.3 ha of foraging habitat for the above listed species. It will also remove approximately 45 hollow bearing trees. There are no previous records of threatened fauna or specific habitat features at the s.75 modification area that suggest the habitat to be removed is important to maintaining local populations of the above listed fauna species. Therefore the removal of these resources is unlikely to cause populations of these species to decline.

The clearing of remnant vegetation would completely remove the existing wildlife corridor into the s.75 modification area. This vegetation is not likely to comprise an important regional wildlife corridor as the area to be cleared is a dead end, since fauna movement to the east, west and farther south is already limited by existing mining operations. There is an important east-west wildlife corridor immediately to the north of the s.75 modification area. The proposal will remove 1 ha of remnant vegetation directly joined to this wildlife corridor which would result in a minor modification by reducing the overall extent of the habitat. However this clearing is at the edge of the corridor and would not isolate or disconnect any vegetation or otherwise impact on fauna movements through the corridor, around the outside of the s.75 modification area. Impacts on regional habitat connectivity would be minor and are unlikely to cause a decline in any mobile threatened fauna species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed activity would probably increase the numbers of invasive weed species in the surface disturbance area. Once this area has been cleared it would no longer constitute habitat for threatened plant species and so this consideration is not relevant to this area. The proposed activity is likely to increase the degree of weed invasion in intact vegetation adjacent to the s.75 modification area, which would constitute threatened species habitat. Observation of the study area during GHD (2008) field surveys suggest that this impact would be confined to the margins of this vegetation, immediately adjacent to the proposed surface disturbance area. This would result in a minor increase in the area of threatened species habitat affected by weed invasion.

Pest animals already occur at the s.75 modification area and would be well established in the agricultural landscapes across the study area and region. The proposed activity is unlikely to affect the occurrence of pest animals in remnant habitat.

Introduce disease that may cause the species to decline

Construction and operation would be restricted to the surface disturbance area for the proposed activity. Threatened species are very unlikely to occur in this area once the proposed activities have commenced. Therefore the proposed activity is unlikely to result in the introduction of disease that may cause threatened species to decline.

Interfere with the recovery of the species

The habitat to be removed by the proposed activity is patchy and isolated and is unlikely to be important to the recovery of threatened plant species. Therefore the proposal is unlikely to interfere with the recovery of these species.

Conclusion

The proposed activity would involve the clearing of approximately 14.3 ha of potential habitat for the above listed mobile threatened fauna species, including important resources such as hollow bearing trees. The impact of this clearing is likely to be minor given:

» The isolated nature of the habitat to be cleared, and ongoing degradation by weed invasion and surrounding mining activities; and

» The absence of previous records in the locality or any specific habitat features or resources that suggest the s.75 modification area is important to any of the above listed species.

Therefore the proposed activity is unlikely to have a significant effect on any EPBC act listed threatened fauna that may occur in the locality from time to time.

Appendix F

EPBC Act Protected Matters Search Results

Australian Government
Department of the Environment, Water, Heritage and the Arts

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

22 December 2008 14:05

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

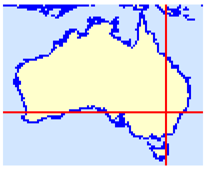
You may wish to print this report for reference before moving to other pages or websites.

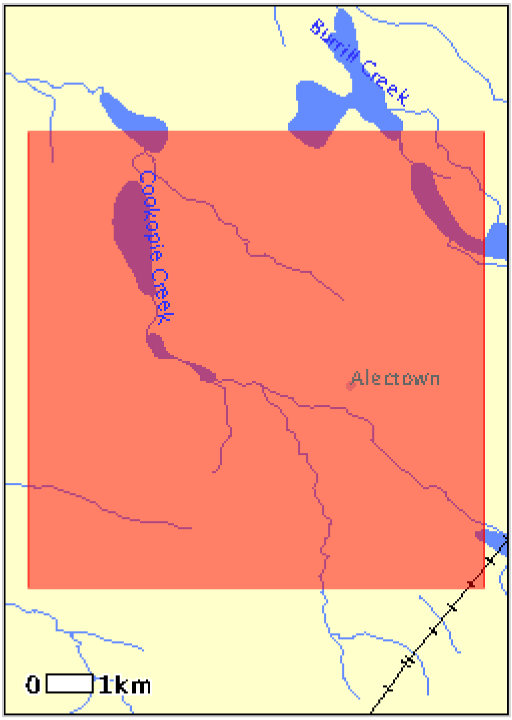
The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Search Type: Area

Buffer: 0 km

Coordinates: -32.85427,148.05581, -32.95760,148.05581, -32.95760,148.15914, -32.85427,148.15914





This map may contain data which are

Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	9
Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	None
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information] (Ramsar Sites)	
MACQUARIE MARSHES NATURE RESERVE	Within same catchment as Ramsar site

Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Lathamus discolor Swift Parrot	Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Xanthomyza phrygia Regent Honeyeater	Endangered	Species or species habitat may occur within area
Mammals		
Nyctophilus timoriensis (South-eastern form) Eastern Long-eared Bat	Vulnerable	Species or species habitat may occur within area
Ray-finned fishes		
Maccullochella peelii peelii Murray Cod, Cod, Goodoo	Vulnerable	Species or species habitat may occur within area
Plants		
Austrostipa wakoolica	Endangered	Species or species habitat likely to occur within area
Diuris sheaffiana Tricolour Diuris	Vulnerable	Species or species habitat may occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson,	Vulnerable	Species or species habitat likely to occur within area

Murray Swainson-pea

Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine	Species or species habitat may occur within area

	area	
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Lathamus discolor Swift Parrot	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Department of the Environment, Water, Heritage and the Arts
GPO Box 787 Canberra ACT 2601
Australia
Telephone: +61 (0)2 6274 1111

Last updated: Thursday, 20-Nov-2008 14:17:56 EST

GHD

10 Bond Street Sydney NSW 2000
-T: 2 9239 7100   F: 2 9239 7199   E: sydmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	B Harrington	B Ryan	*Brendan Ryan*			18/11/08
1	B Harrington	D Waddell	(p.p)	D Chubb		21/11/08
2	B Harrington	D Chubb		D Chubb		22/12/08
3	B Harrington	D Waddell	*David Wadell*	D Waddell	*David Wadell*	13/01/09
4	B Harrington / D Williams	D Chubb		D Chubb		6/2/09

Appendix E

Aboriginal Heritage Assessment

145 Wingewarra St
PO Box 2069
Dubbo, NSW, 2830

Phone: (02) 6882 0118
Fax: (02) 6882 0630

ABORIGINAL CULTURAL HERITAGE ASSESSMENT SECTION 75W MODIFICATION

NORTHPARKES MINES

PARKES, NSW

DECEMBER 2008

REPORT PREPARED BY

OZARK ENVIRONMENTAL AND HERITAGE MANAGEMENT P/L

FOR

GHD SYDNEY

ON BEHALF OF

NORTHPARKES MINES

jodie@ozarkehm.com.au
phil@ozarkehm.com.au
Web:ozarkehm.com.au

Executive Summary

OzArk was commissioned by GHD Pty Ltd on behalf of Northparkes Mines (NPM) to undertake the Aboriginal cultural heritage assessment component of the Environmental Assessment Report (EA) for proposed modifications to the NPM site.

This report documents the Aboriginal Cultural Heritage Assessment undertaken at Northparkes Mines, located 27 kilometres north–northwest of Parkes, NSW, on Tuesday 25 and Wednesday 26 November 2008.

One Aboriginal site, a culturally modified (scarred) tree (NPM-ST1) was recorded.

As the Project is likely to damage or destroy NPM-ST1 and moving the tree to a secure location will likely result in its disintegration it is recommended that NPM-ST1 be recorded to archival standards. The archival record should include a full photographic record (on film in both black/white and colour), accurate measurements and descriptions, and a cast of the scar.

An additional area was included in this study: the location of the secondary and tertiary crushers that will be constructed to the south of Goonumbla Creek (see Figure 5). This area has been the focus of previous archaeological excavation and cultural heritage survey (OzArk 2008c).

Impacts within Zone 1 are covered by management measures within the AHMP. It is recommended that specific management of the surface crusher operations involves local Wiradjuri representation to monitor removal of topsoil material.

The landforms surveyed for the Project area were assessed as having overall low potential for the existence of undetected sub-surface archaeological deposits.

Should the recommendations regarding NPM-ST1 and local Wiradjuri representation during topsoil removal be adhered to, there is no further impediment to the Project on the grounds of cultural heritage.

TABLE OF CONTENTS

FIGURES

APPENDICES

1. INTRODUCTION

OzArk was commissioned by GHD Pty Ltd on behalf of Northparkes Mines (NPM) to undertake the Aboriginal cultural heritage assessment component of the Environmental Assessment Report (EA) for proposed modifications to the NPM site.

The proposed modifications (the Project) to Development Consent (DC 06-0026) that will be considered in the EA are:

- Construction of a new tailings storage facility ("Estcourt" TSF) including any associated floor preparation and drainage system;
- Upgrades and modifications to existing processing infrastructure including:
    - Module 1 and 2 Grinding Circuits,
    - Module 1 and 2 Flotation Circuits,
    - Module 3 Flotation Circuit,
    - Concentrate Handling Facilities, and
    - Tailings Handling Facilities;
- Installation of a secondary and tertiary crusher adjacent to the hoisting shaft at underground operations;
- Increase the limit of Approval from 6.5 million tonnes of ore per year to 8.5 million tonnes of ore per year processed; and
- Extend the life of the mine through to 2025 through more efficient mining of the E48 resource.

This report details the results of the Aboriginal cultural heritage survey conducted at NPM, Parkes, NSW (Figure 1).

1.1 Background

Since 1990, four Aboriginal cultural heritage assessments have been carried out in the face of various developments at NPM.

An Aboriginal Heritage Assessment was prepared as a specialist study to accompany the Environmental Assessment – Northparkes Mines E48 Project (R.W. Corkery 2006). The above mentioned assessment addressed potential impacts on Aboriginal heritage arising from the E48 project. The study area for the above mentioned assessment included survey effort within the footprint for the Project.

This supplementary Aboriginal heritage survey was undertaken to obtain an up to date assessment of significance and assess impacts on Aboriginal heritage associated with the Project.

1.2 Scope of Works

The Aboriginal cultural heritage survey was to investigate the area of land that will be impacted by the “Estcourt” TSF and the surface crusher operations. The nature of the works that will impact on the study area is shown in (Figures 4 and 5). These impacts include the construction of the “Estcourt” TSF, associated pipelines, drainage lines and roads. An additional area for the surface secondary and tertiary crushers near Goonumbla Creek (see Figure 5) is included within this study. The secondary and tertiary crushers are located within Zone 1 (a designated area of moderate archaeological sensitivity – see section 4.3).

1.3 Report Authorship

This report was written by Ben Churcher (OzArk EHM). Community involvement and the environmental sections of this report are by Phillip Cameron (OzArk EHM) and Dr Peter Mitchell (Ground Truth Consulting). The report was reviewed and edited by Dr Jodie Benton (OzArk EHM).

The report was reviewed and approved for submission by the Aboriginal Heritage Working Group (AHWG) on Friday 12 December 2008.

2. ABORIGINAL COMMUNITY INVOLVEMENT

At the inception of the E48 project in 2006, the *Interim Community Consultation Requirements* were implemented in their entirety as identified in the Northparkes Mines – E48 Project Environmental Assessment report (R.W. Corkery, 2006). This resulted in the identification of two community stakeholder groups – the Peak Hill Local Aboriginal Land Council (PHLALC) and the Wiradjuri Council of Elders (WCE).

Under Condition 28 of DC 06-0026, NPM was required to prepare and implement an Aboriginal Heritage Management Plan (AHMP) to the satisfaction of the Director-General. Throughout 2007, in accordance with the approval, the AHMP was developed in consultation with the Aboriginal community groups and DECC and approved by the Director-General on 5 May 2008. The ongoing consultation protocol that NPM undertakes is outlined in Section 7 of the approved AHMP.

An AHWG has been established in accordance with Section 7 of the AHMP. The AHWG consists of two representatives from PHLALC, WCE and NPM. The Working Group has met on a regular basis over the past year, with five meetings held to date.

NPM sought dispensation from Department of Planning (DoP) in October 2008 for the requirement to undertake the entire ICCR process again due to the current extent and formality of the local Wiradjuri community involvement in the management of Aboriginal heritage at NPM. A copy of this letter can be found in Appendix 2.

Approval was granted by the DoP via email on 6 November 2008 for this approach (Appendix 2). The Aboriginal community consultation would be managed through the AHWG, with an advertisement being placed in local print media to allow the registration of interest of additional parties. A copy of this advertisement is also presented in Appendix 2. No further registrations of interest were received.

Consequently, local Wiradjuri community involvement in the methodology for this Aboriginal cultural heritage survey was determined by the AHWG in the meeting held on Monday 27 October 2008. A list of the local Wiradjuri community representatives who participated in the survey fieldwork are as follows:

- Robert Clegg – WCE
- Thomas Peckham – PHLALC
- Anthony Wilson – PHLALC

- Sean Biden – NPM escort

Figure 1: Location of NPM (source NPM).

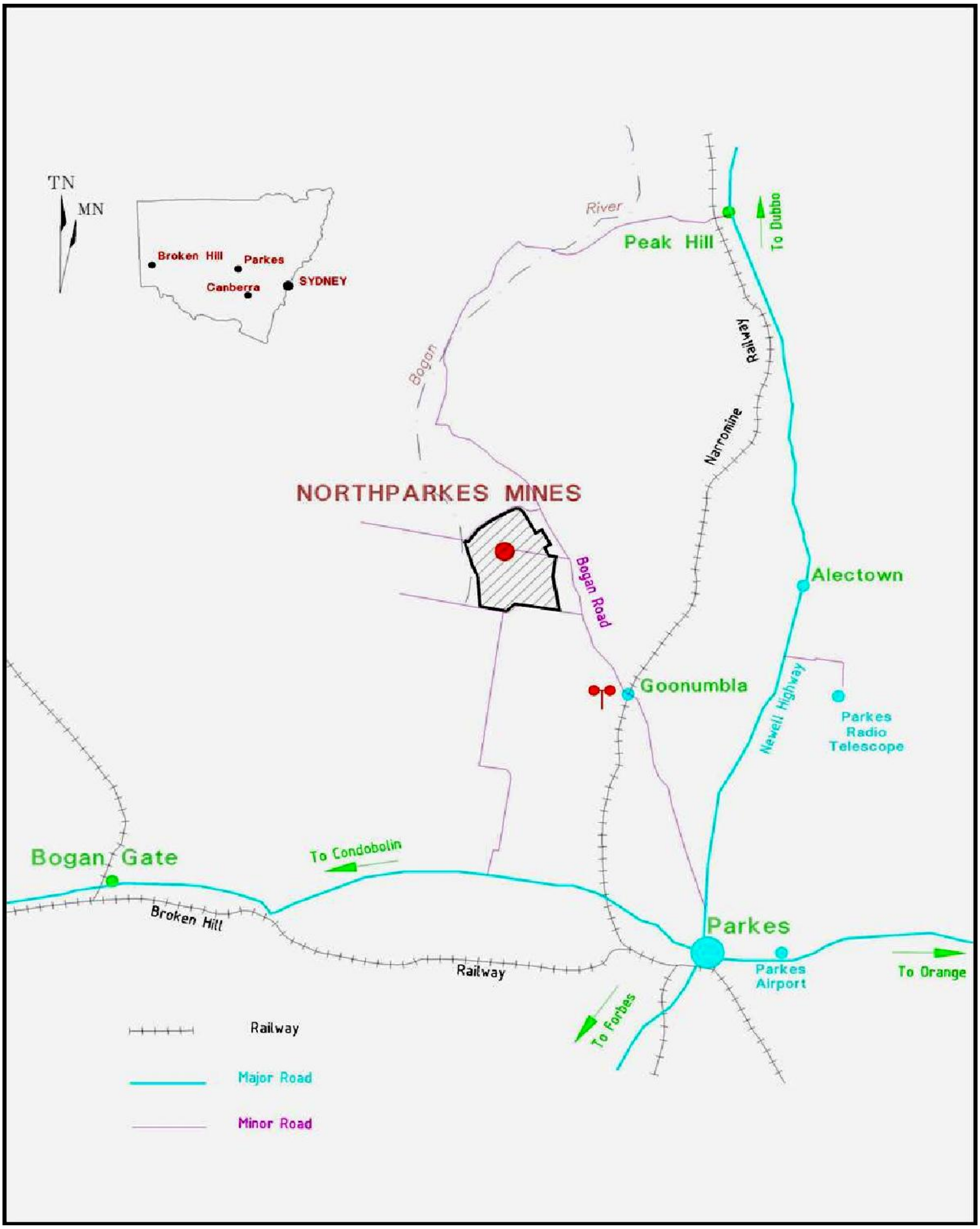
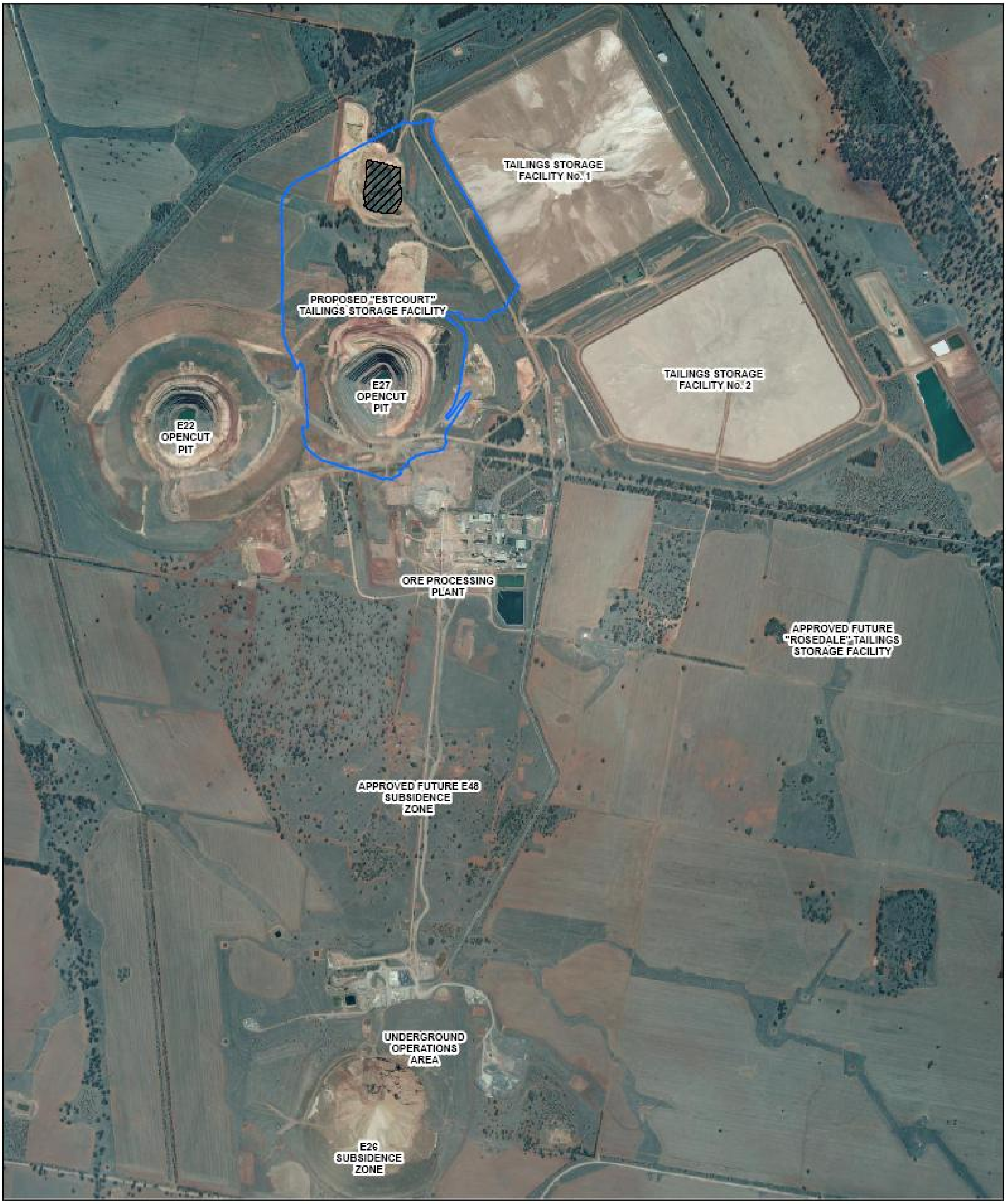


Figure 2: Location of the study area.



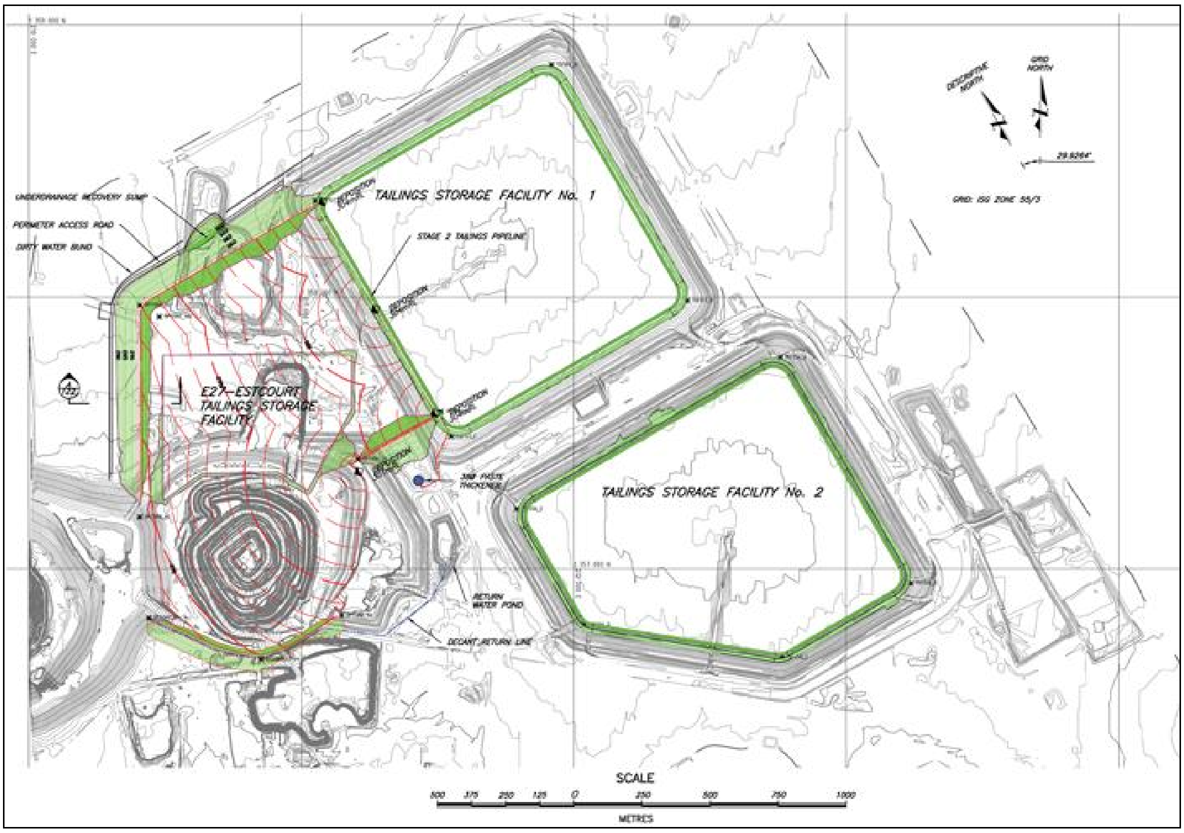
LEGEND

Disturbance Area

'Anna's Island', Approved vegetation clearing conducted September 2008.

Figure 3: Location of the discreet areas within the "Estcourt" TSF study area.

Figure 4: Plan showing the proposed "Estcourt" TSF.



Discussions were held in the field between the archaeologist and the local Wiradjuri community to define survey effort, the type and nature of each impact and assessed requirements for mitigation or management measures. The local Wiradjuri community were encouraged to bring forward any issues of concern and had full access to representatives of the client, the archaeologist and other communities for confidential or group discussions.

3. THE STUDY AREA

NPM is located 27 kilometres north–northwest of the township of Parkes in New South Wales. The study area surveyed for the Project is located to the north of the NPM mining lease (Figure 2).

The study area was restricted to the impact footprint of the Project (Figure 4, 5). Survey was restricted to the more undisturbed areas of the total impact footprint as other areas, although they will be impacted by the Project, have already been extensively disturbed by prior mining activities (see aerial view in Figure 3).

Figure 3: Location of the discreet areas within the "Estcourt" TSF study area.

Figure 5: Location of the proposed surface crusher operations at NPM.

An example of an area within the proposed “Estcourt” TSF which was not surveyed as part the current study area is the existing E27 open cut pit as obviously any cultural material in this region would have been previously destroyed.

In addition, within Area 2 (see Figure 3) the only portion surveyed is shown by the smaller portion within Area 2 that contains some remnant vegetation. All other areas outside of this (but within Area 2) were deemed by the survey team to have been extensively disturbed and that further investigation was unwarranted.

While observing Figure 3 it could be noted that there seems to be an area of woodland to the west of Area 2 that was not surveyed. However, this area of woodland has been cleared and “Estcourt” borrow pit material removed in accordance with the existing DC06-0026.

The study area included a buffer zone around the proposed impact footprint to ensure that any cultural material that may exist close to the Project area would also be recorded.

An additional area was included in this study: the location of the secondary and tertiary crushers that will be constructed to the south of Goonumbla Creek (see Figure 5). This area has been the focus of previous archaeological excavation and cultural heritage survey (OzArk 2008c).

3.1 Geology and Topography

The ore bodies at NPM belong to a broad class of deposits called porphyry copper-gold deposits. Geologically the NPM ore bodies are pipe like intrusions of quartz monzonite within mid-Ordovician andesitic lavas and associated volcanic sandstones, shale and a small amount of limestone. Very little rock outcrop occurs on the mining leases and none of the local rock types except probably pebbles of vein quartz are known to have been used for the manufacture of artefacts by the local Wiradjuri people.

The mining leases lie at the head of the Bogan River close to the Lachlan – Bogan divide. The landscape is subdued with a few low hills rising above the general plain and the river and its tributaries meander across the plain. The plain is underlain by deep fine-grained alluvium that in turn lies on a deeply weathered regolith. Some of the Bogan palaeochannels are filled with 8m or more of mottled clay sediments. The age of these features is poorly established but they are certainly geological (Pillans, 1998) and millions of years earlier than the arrival of Aboriginal people in Australia. The palaeochannels are not visible on the surface or on air photographs but have been identified by geophysical survey, in an extensive drilling program, and they have been exposed in the walls of the open cuts.

3.2 Rainfall and Stream Flow

Average annual rainfall in the area is 531mm and average monthly rainfall is between 38 and 55mm. Monthly pan evaporation greatly exceeds rainfall throughout the year and consequently the streams normally contain no surface water and stream flow is a rare event driven by exceptional sustained rainfall (Raymond 2002[1]). As the stream beds are

[1] Cited in Mitchell, P. 2008 *Geomorphic and pedological context of the Aboriginal archaeological survey on Goonumbla Creek at NorthParkes Mines.*

lined by grey and brown clay, pools of water can survive for weeks to months after a stream flow event and although the hydrology of this system has undoubtedly changed since Aboriginal times as a result of European land use it is reasonable to predict that pools with greater longevity would have been a focus for human occupation in the past. The difficulty for archaeologists today is to identify the probable sites of such waterholes in the eighteenth century landscape. Elsewhere in NSW a model of Aboriginal land use based on stream order has been reasonably successful in predicting site location. In this landscape however with low angle slopes and less frequent stream flow because of greater aridity the model may need to be modified.

3.3 Vegetation

The predominant vegetation of the area is white and yellow box, although the study area has been largely cleared of all former vegetation and is now a mix of remnant woodland and various grass species.

To the south of the study area is the Limestone National Forest (LNF). This area has previously been subject to recurrent logging and grazing. The floral community is largely dominated by mature white cypress pines along with some poplar box and grey box. The understorey is almost entirely introduced weed species. The LNF provides habitat mainly for common and robust woodland-agricultural species but is remote from and unconnected with more diverse woodland areas (such as the Bogan River communities).

3.4 Existing levels of disturbance

Europeans have occupied this part of the central west of NSW since the 1840s and during the 20th Century it was extensively cleared of timber for the cultivation of grain and for grazing. The original vegetation would have been open woodland of grey box, yellow box and white cypress pine with other western species such as rosewood and several acacia in the understorey. Remnants of all of these remain especially in LNF but even there logging of cypress pine and the removal of eucalypt species have modified the vegetation. Most of the plains have been cleared and repeatedly cultivated, trees along Goonumbla Creek have been almost entirely removed except for a few river red gum and yellow box but tree cover along the Bogan River (outside the lease) is more intact.

Because stream flow is a rare event and the stream gradients are so low, the channels in the headwaters of the river have not been so extensively modified by erosion as might be expected in an agricultural landscape. Some channel incision (erosion) is evident and areas of floodout are covered with a thin veneer of post-European sediment. Of more importance in the study area are disturbances caused by cultivation, sheet erosion, some wind erosion, track and fence construction, graded fire-breaks around crops and the forest margin, soil compaction by stock, and the earlier presence of a number of buildings. The net effect all of these elements is that the soil biomantle has been thinned, compacted and repeatedly turned over. As Aboriginal artefacts are normally confined to the biomantle in texture contrast soils (for discussion of this concept Dean-Jones and Mitchell, 1993) all of the open sites will have been disturbed to the extent that they will have lost any stratigraphic integrity that may have existed and site use patterns (workshop areas or hearths for example) will have been disturbed to the extent that they may be difficult to interpret. See Paton *et al*., 1995 and Johnson, 1989 and Johnson, 2002 for descriptions of this concept[2].

The entire study area has suffered various levels of disturbance to any archaeological deposits had they once existed. In summary, disturbances to the study area include:

- **Area 1:** Predominantly occupied by re-growth Grey Box/Cypress woodland. The area has been grazed but never ploughed. A remnant patch of woodland exists but it is surrounded by borrow pit activities. It was estimated that 95% of the trees in this area are re-growth. There was moderate (c. 30%) ground surface visibility with grasses and leaf litter being the prime inhibitors to visibility (Plate 1).

- **Area 2:** Area 2 is characterised by a high degree of disturbance including areas covered with imported road material (Plate 2). The area has been predominantly cleared of native vegetation with very little re-growth. The present vegetation is dominated by grasses. In one area there is a pocket of remnant vegetation consisting of standard Myall trees, cypress and a few mature Bimble Box existing, cut by an artificial drainage channel. It was estimated that there was 10% ground surface visibility.

- **Area 3:** Currently occupied by a wheat crop with significant disturbance through long term ploughing activities. There was good ground surface visibility (50%) between the rows of wheat (Plate 3).

- **Area 4:** Contains patches of remnant vegetation surrounded by significant areas of disturbance. The area has been extensively cleared although there are occasional mature Eucalypts (Plate 4). Area 4 does not appear to have been ploughed. There was a maximum ground surface visibility of 10% across Area 4 as vegetation obscures a clear view of the ground surface. In addition, the true ground surface of regions within Area 4 was obscured by redeposited clays from nearby mining activities (Plate 5).

- **Area 5:** A very disturbed area that is mostly comprised of mounded, stockpiled topsoil that has been revegetated. There is a narrow margin of undisturbed area between the haul road and the topsoil stockpile. Ground surface visibility was low at around 0-5% as vegetation obscured the ground surface (Plate 6).

4. ABORIGINAL HERITAGE

4.1 Ethnographic Context

The original occupants of the study area were the local Wiradjuri tribal and linguistic group (Kabaila 1997). The Wiradjuri tribal area is situated within the Murray Darling Basin, covering three primary physiographic divisions:

---

[2] Cited in Mitchell, P. 2008 *Geomorphic and pedological context of the Aboriginal archaeological survey on Goonumbla Creek at NorthParkes Mines.*

- The riverine plains in the south west;
- The transitional western slopes in between; and
- The highlands or central tablelands in the east.

The study area falls within the central division, being the transitional western slopes into the central tablelands, the heart of Wiradjuri territory.

Episodes of early contact between Wiradjuri and European cultures from the nearby Lachlan Valley (c. 60 kms south) were documented by the explorers Oxley and Cunningham in May 1817. Oxley (1817) writes:

> *About a mile from this place we fell in with a small tribe of natives, consisting of eight men; their women we did not see. They did not appear any way alarmed at the sight of us, but came boldly up: they were covered with cloaks made from opossum skins; their faces daubed with a red and yellow pigment, with neatly worked nets bound round their hair: the front tooth in the upper row was wanting in them all: they were unarmed, having nothing with them but their stone hatchets. It appeared from their conduct that they had either seen or heard of white people before, and were anxious to depart, accompanying the motion of going with a wave of their hand.* (Whitehead 2003: 105).

Cunningham (1817) reported:

> *Calling to one another we were answered by strange voices, which left us in no doubt of natives being near us. It was a great point we should all join in again, which at length we did, after some time had passed over several miles on a cross-course, the labour of which might have been saved. Our people came up with seven or eight of the natives, who were clothed in mantles of skin reddened with a pigment from the river. There appeared not the most distant symptoms of hostility among them! They evidently had seen a horse before, and could pronounce some words in English, such as bread, and they had every appearance of having been with those at the Lachlan depot, from which we are now 54 miles west. From the columns of smoke ascending from the trees to which these harmless beings were advancing there is no doubts of their encampment being these situated, and it might be inferred that their gins or wives were there, from their evident objection to our people attempting to accompany them to their fires. The delay and loss of time occasioned by the above adventure had allowed our boatmen to work themselves through all the numerous windings of the river and overtake us.* (Whitehead 2003: 105).

Closer to Parkes, but somewhat later (1835), came accounts of contact with native groups by the Mitchell expedition, which had set out to explore the Bogan River (Unger n.d.: 3; Kass 2003: 6). In April 1835 Mitchell's party encountered a group of natives on the outskirts of what is today the town of Parkes. From this meeting, Mitchell learned that what had been named the Hervey Range by Oxley in 1817 was in fact known to the locals as 'Goobang', which derived from the Wiradjuri word Coleong Coobung, which meant place of many wattles (Kass 2003: 9). Mitchell's group camped within earshot of the Wiradjuri camp and his account is quoted by Unger (n.d.: 4):

> *The natives who we met here were fine looking men, enjoying contentment and happiness within the precincts of their native woods. Their enjoyment seemed so derived from nature, that it almost excited a feeling of regret, that civilised men, enervated by luxury and all its concomitant diseases, should ever disturb the haunts of these rude happy beings. The countenance of the first man who came up to me, was a fine specimen of man in an independent state of nature. He had nothing artificial about him, save the badge of mourning for the dead, a white band (his was very white), round his brow. His manner was grave, his eye keen and intelligent, and, as our people were encamping, he seemed to watch the moment when they wanted fire, when he took a burning stick, which one of the natives had brought, and presented it in a manner expressive or welcome, and an unaffected wish to contribute to our wants. At a distance, their gins sat at fires, and we heard the domestic sounds of squalling children.*

When Mitchell's party left their camping spot, several natives reportedly followed them, one of whom speared a large kangaroo, while others used new tomahawks to extract honey from tree branches. It is recorded that the natives accompanied the expedition for four days before retreating upon the appearance of further natives. This was interpreted by Mitchell as the original group of natives having reached their tribal boundary (Unger n.d.: 5).

Ethnographic information gleaned from this expedition included the following about the Bogan Wiradjuri (Kass 2003: 6):

- They lived on possum, kangaroo and emu;
- Women fished using a moveable dam of twisted dry grass to corral fish so they could be picked out of the water and they collected freshwater mussels; and
- Starchy plant roots and honey were eaten.

As in most parts of NSW, white diseases were a precursor to white settlement and the population encountered by early settlers was already impacted by this. Tales of early white settlement include stories of clashes including massacres of the natives and revenge attacks.

4.2 Regional Archaeological Context

The most relevant two studies are Pearson (1981)[3] and Koettig (1985). Together these provide baseline data for placing past Aboriginal sites within a regional landscape context. Following is a summary of the salient points learned from these studies:

Pearson (1981) worked primarily in the Upper Macquarie region, the western boundary of his study area being Wellington. The general proximity of his study area makes the findings of this work relevant. The majority of Pearson's field coverage was directed by information from informants and was thus skewed toward large or obtrusive sites, which had been recognised by local residents. Pearson excavated three rock shelter sites (Botobolar 5, and Granites 1 and 2) which provided a regional record of Aboriginal

[3] M. Pearson's 1981 study is an unpublished PhD thesis from the ANU. The authors have been unable to directly access this work and rely heavily on summaries presented in Koettig (1985).

occupation dating back to around 5,000 years before present. Pearson's analysis of the patterns of Aboriginal occupation involved an examination of site location characteristics in four sample areas.

According to Pearson archaeological sites could be divided into two main categories, occupation sites and non-occupation sites (which included grinding grooves, scarred or carved trees, ceremonial and burial sites etc.). An analysis of the location of these sites led him to build a model for site prediction along the following lines (Pearson 1981: 101):

- Site distance to water varied from 10 to 500 m, but in general larger sites are found closer to water;
- Good soil drainage and views over watercourses are important site location criteria;
- Most sites were located in contexts, which would originally have supported open woodlands;
- Burial sites and grinding grooves were situated as close to habitation areas as geological constraints would allow;
- Ceremonial sites such as earth rings ('bora grounds') were located away from campsites;
- Stone arrangements were also located away from campsites in isolated places and tended to be associated with small hills or knolls or were on flat land;
- Quarry sites were located where stone outcrops with desirable working qualities were recognised and were reasonably accessible; and
- Based on ethnohistoric information, Pearson suggests that Aboriginal campsites were seldom used for longer than three nights and that large archaeological sites probably represent accumulations of material over a series of short visits.

The location of non-occupation sites was dependent on various factors relating to site function. For example, grinding grooves only occur where there is appropriate outcropping sandstone, but as close to the occupation site as possible. Scarred trees were variably located with no obvious patterning, other than proximity to watercourses, where camps were more frequently located.

Although a useful study, Koettig (1985: 49–50) considers Pearson's findings as preliminary, mainly due to the unsystematic nature of the recording of most sites used in the analysis. In her view, this would have skewed both site type (obvious manifestations) and location (areas of disturbance), therefore biasing the sample. Further the sample size of both the Wellington and other areas were considered too small to yield significant results.

Also relevant to the current project is Koettig (1985), who undertook a comprehensive study of evidence relating to Aboriginal occupation within the Dubbo area, including c. 5 km around the city limits. As a result of the desktop component of this study, Koettig determined there was need for systematic survey to ensure that all topographic landform units and different stream order associations were explored in terms of site type and location. This field work included detailed recording of various site types, ensuring the presence of comparative, quantifiable data. The field survey was undertaken by dividing the broader Dubbo study area into five sample Survey areas covering the three major physiographic zones, but was constrained by time and an inability to access privately owned land.

As a result of this study, Koettig (1985: 81–82) concluded that:

- Aboriginal sites may be expected throughout all the landscape units surveyed.
- The most frequently occurring site types were open artefact scatters, scarred trees and grinding grooves.
- The location of sites and their relative size were determined by various factors, predominantly environmental and social. Although social factors cannot be explained through archaeological research, some of the environmental issues may be. These are:
    - *Proximity to water:* the largest campsites were located close to permanent water, nonetheless, sites were found all over the landscape including hills and ridges away from obvious water.
    - *Geological formation:* Certain sites require specific conditions, e.g. grinding grooves occur where appropriate sandstone outcrops, quarries are found where suitable stone resources are accessible, burials tend to be found in sandy sediments such as alluvial flats etc.
    - *Availability of food resources:* The widest range of potential foods was found along the main water courses due to the supply of permanent water. Some foods would have been seasonal and required foraging away from water courses.

In predicting intensity of occupation, Koettig suggests that larger and more constantly occupied sites are likely to occur along permanent watercourses, while less intense and sporadic occupation evidence is seen along ridge tops or temporary water sources e.g. creek headwaters.

The predictive model for site location developed as a result of this study can be summarised as follows:

- all site types can be found along watercourses;
- stone arrangements occur most frequently on knolls or prominent landscape features;
- larger campsites are most frequent along permanent watercourses, near springs or wetlands, although small campsites may be found anywhere. Because occupation was more intensive along major watercourses, more site complexes will be found there;
- scarred trees may be found anywhere there are remnant stands of native trees;

- campsites would become smaller and more sporadic near the headwaters of creeks;
- grinding grooves are most frequent in association with appropriate sandstone;
- quarries may be found wherever there is a reliable sources of suitable stone; and
- shell lenses (midden material) would only be found along the Macquarie River.

Wiradjuri heritage in the region of NPM has been documented through several minor development-related heritage assessment projects.

The nearest large scale investigation in the region relates to the Lake Cowal Gold Mine, approximately 100 km to the southwest of the study area. As a result of the Barrick Gold Cowal operations, a large number of sites and artefacts have been recorded; primarily open artefact scatters and scarred trees. It has been noted that when explorers first came to Lake Cowal they recorded tribal Aboriginals using the area as a campsite and ceremonial site.

In 2006, Environmental Resources Management (ERM 2007) recorded 21 sites on the location of the proposed Condobolin Ethanol Production Facility situated 5 km west of Condobolin about 100 km west of the study area. These sites comprise mostly of flaked stone artefacts with some grindstone fragments. A total of 90 artefacts were recorded at all sites, mostly comprising flakes and broken flakes, grindstone fragments and a few cores. The artefact types and raw materials were typical of the region and while cores were present, small debitage was absent indicating the lack of knapping floors. All sites consisted of low numbers of highly dispersed artefacts.

Other surveys in areas away from the permanent water of the Lachlan and other rivers display a very low density of artefacts. J. Appleton (2002) surveyed 975 ha of red, sandy soil 30 km west of Condobolin in 2002 and recorded a single artefact. A previous survey by Appleton for the Syerston Nickel-Cobalt project located 20 km north of the Lachlan (Appleton 2000), recorded low artefact numbers (less than 10) and isolated artefacts in areas not in close proximity to reliable water. Over the area of a 90 km pipeline for the project, Appleton recorded four isolated finds in areas away from water and one extensive artefact scatter on the banks of a major watercourse. Five scarred trees were also recorded in close association to major watercourses.

In 2006 Navin Officer (P/L) conducted a heritage assessment for the proposed Parkes Peaking Power Plant and associated corridors (URS 2006). The proposed power plant is located west of Parkes on the Condobolin Road and to the south of the study area. As a result of this survey, one possible modified tree was recorded and no landforms were assessed as having archaeological potential.

In 2008 the Australian Museum conducted a heritage survey for the proposed Wellington Gas Pipeline which is proposed to run from Wellington to the railway line at Alectown (Australian Museum, 2008). The southern end of this survey is around 10 km east of the study area. This survey recorded an artefact scatter (site 2) 6.1 km north–east of Alectown on the banks of Kadina Creek. The site, which measures 25 x 10 m, comprises a total of 11 artefacts that were not recorded *in situ*, eroding from the bank, but were apparently moving down the slope from the ridge above. The recorded artefacts were of chert, silcrete and quartz. The quartz artefacts were bipolar flakes and the chert and silcrete artefacts were flakes.

Eleven kilometres north–east of Alectown, the survey recorded a modified tree (site 3). The scar, measuring 50 x 40 cm is located 4 m from the ground and no other cultural material was observed in association with the modified tree.

In 2008 OzArk EHM conducted a heritage assessment of the corridor options for the proposed Manildra–Parkes 132kV Electricity Transmission Line (ETL) which is located to the east of the study area (OzArk 2008b). While it was noted that twenty-six (26) sites had been previously recorded over all potential corridors being studied (of which 80 % were culturally modified trees), no new sites were recorded as a result of the assessment. However, the report (p. 26) notes that the primary focus of the assessment was a general archaeological assessment of many locations along the proposed study corridors in an attempt to characterise the potential Aboriginal heritage values of various portions of the corridors.

4.3 Local Archaeological Context

OzArk (2008a) prepared a desk-top study of previous aboriginal heritage assessments undertaken over the NPM mining leases and a summary is presented here.

<u>Stone, T. 1986 An archaeological survey of Goonumbla Mining Lease. Report to Peko-Wallsend.</u>

A total of 16 sites were recorded as a result of this assessment, 13 being open artefact scatters, of which one was associated with a culturally modified tree, with a further isolated find also recorded. Overall sites were small and in poor condition, either disturbed by ploughing or erosion. Fifteen of these sites were located along the Bogan River or one of the two tributaries assessed during the study. Seven of the sites were within 1 km of the confluence of Goonumbla Creek and the Bogan River. Sites were assessed by the PHLALC representative at that time as being of limited cultural significance due to their low integrity, although their value as a teaching resource was noted. Scientific significance was assessed according to site integrity (condition); structure (size / complexity); content (artefacts / raw materials) and representativeness (rarity factors). Against these criteria, all 16 recorded sites were assessed as being a ‘low significance’. Only six of the 16 recorded sites are within the current boundaries of the NPM mining leases.

<u>Nicholson, A. 1990 Archaeological survey of additional area to be included in the Northparkes Project located near Parkes, NSW. Report to Natural Systems Research P/L.</u>

As proposed impacts of gold and copper mining over the area of the Goonumbla Mining Lease altered in the years following initial project assessment, further Aboriginal heritage survey was undertaken in 1990 by Nicholson to assess new impact locations. The primary new impact was the tailings dam which was to be located in an area not previously assessed by the 1986 survey although within the area known as the Goonumbla Mining Lease. At this time, Ray Keed, representing the Warramunga Advancement Co-operative Society (WACS) accompanied the survey team.

The tailings dam was to be situated on flat to gently undulating land at the north-eastern boundary of the mining lease over previously cleared paddocks that had been either ploughed or grazed. Dense grass reduced visibility and hence site detection and as a result, survey was focussed on fence lines and the areas around dams which provided limited windows of visibility and resulted in coverage of c. 4% of the impact area.

No archaeological sites were recorded as a result of this assessment. The lack of sites was not considered surprising due to the distance from permanent water and the type of landscape assessed. There were consequently no constraints to the proposed construction of the tailings dam at the assessed location on the grounds of cultural heritage.

<u>Appleton, J. 1996 The archaeological investigation of the site of proposed extensions to existing mining operations, E48 development – NPM, north of Parkes, Central West, NSW. Report to R.W. Corkery & Co P/L on behalf of NPM.</u>

To facilitate continuation of operations, Aboriginal heritage assessment was required over areas proposed as extensions to the existing mining operations, predominantly over portions of Limestone National Forest and adjacent agricultural lands. Newly proposed impacts included E48 mine headworks, a ventilation shaft, construction roads and minor subsidence. At this time, Stanley Bell of the PHLALC participated in the survey and George Robinson, a traditional owner and elder, was also consulted regarding the significance of the recorded sites.

The survey area was noted as being about 60% cypress pine, although it was likely to have been box dominated dry sclerophyll open woodland in prehistory. The area contains an elevated depression in the northern portion and undifferentiated gentle slopes down towards Goonumbla Creek in the southern. Prior land-use impacts within the survey area were noted as including logging, grazing, and in some locations, ploughing. Survey effort was focussed on areas around such features as erosion scars, tracks etc., anywhere that offered greater than 25% visibility, and despite the variable visibility, survey coverage was assessed as effective.

Four (4) archaeological sites were recorded as a result of this assessment, three (3) being isolated finds (P2, 3 and 4) and one (1) being a possible scarred tree (P1). The overall paucity of archaeological material was interpreted as relating to the fact that the study area was dry sclerophyll woodland with no specific water source or other resources that would concentrate Wiradjuri occupation and was more likely used for activities such as foraging.

The recorded sites were assessed by the PHLALC as being of low cultural significance and were also assessed as being low scientific and educational significance.

<u>Paton, R. (Australian Archaeological Survey Consultants) 2006 NPM E48 Project – Aboriginal Heritage Assessment. Report to R.W. Corkery & Co P/L on behalf of NPM.</u>

Renewed interest in the E48 project provided a need to reinvestigate in the face of altered impacts over the NPM mining leases. The aims of this assessment included the relocation and assessment of previously recorded sites, survey of areas to be impacted by the current proposal and the delineation of zones of potential archaeological sensitivity within the study area. Newly proposed impacts included the development of underground block cave mining and associated subsidence impacts, areas proposed for tailings and waste rock emplacement as well as borrow pits.

Aboriginal community consultation was undertaken according to the Department of Environment and Climate Change (DECC) *Interim Community Consultation Requirements* (ICCR's). The Stage 1 notification process of the ICCR's resulted in the identification of the PHLALC and an individual from Parkes (Lionel Bloomfield) as stakeholders for the project. Ken Robinson from the PHLALC participated in the field survey of the NPM study areas.

The study area was noted as being highly modified with the only area not completely cleared and disturbed being that of the Limestone National Forest, despite it having been logged in the past. Survey was undertaken in transects which targeted the zones. Overall survey coverage of the proposed impact areas was determined as high, being 45–50%.

Three new sites were recorded as a result of this assessment, one small open camp site and two isolated finds (A1, A2 and A3 respectively). Figure 6 displays the results of Paton's 2006 survey.

In terms of zones of archaeological sensitivity, Paton divided the mine site into four zones): Zone 4 — zero sensitivity (disturbed by mining impacts); Zone 3 — very low sensitivity (flat waterless terrain – 35% of site); Zone 2 — low sensitivity (Limestone National Forest – 10% of site) and Zone 1 — medium sensitivity (Goonumbla Creek – 5% of site). It was noted that the Zone 1 area provides potential for sites close to the water course on flat, elevated terrain. These are most likely to be surface scatters although there is an assessed low potential for stratified sub-surface archaeological deposits.

<u>OzArk EHM. 2008c Test Excavation and Salvage Program, Northparkes Mine, Parkes NSW. Report to NPM</u>.

In October 2008 OzArk EHM conducted a test excavation and salvage programme within an area of Zone 1 (as defined by Paton above) which is to be impacted by the E48 overland conveyor. Figure 7 shows the location of the test excavation program.

river deposited material within them, or more likely, given the nature of the raw material, they were brought into the area as material to stabilise road surfaces. Through use of the roads, particularly in wet weather, this material has been pushed down into the soil profile. The clay nodules were probably derived from clay that has been baked as tree roots were burnt during the clearing of the land. None of the clay nodules displayed any indication that they were originally heat retainers from ancient hearths in that they were small and often had root impressions in them. The charcoal, like the clay nodules, was probably derived from the burning of the original vegetation at the time of European settlement. These charcoal fragments were recorded scattered throughout the deposit without any discrete concentrations being noted by the excavators.

Thirteen items were identified during the programme as artefacts. However, 5 items (38% of the total) were, in the cataloguer's opinion, only of "possible human manufacture". This determination was reached as the items in question did not clearly display the features of a flake that would make it of indisputable human manufacture. Therefore only 8 items were definitely identified as artefacts of human manufacture (i.e. they display all of the features required on both the ventral and dorsal surface of the flake).

As another aspect of the test excavation programme, a spoil heap was sieved to retrieve cultural material. This spoil heap had been created when a drill pad was cleared in September 2007. The sieving of the spoil heap recovered 23 artefacts, including a greyish green ground-edge hand-axe. Of the 23 artefacts 7 have been listed by the cataloguer as ‘possibly of human manufacture’. In general, the cataloguer noted that many of the artefacts originating from the spoil heap were possibly not of Wiradjuri origin, but were possibly formed as a result of rock crushing (i.e. intrusive material brought in for road construction).

Of the 27 excavated test pits, 20 (74%) did not contain any artefacts or other cultural material.

Most pits, however, contained intrusive, non-cultural material in the form of rounded pebbles, clay nodules and charcoal fragments. The geomorphologic assessment of the rounded pebbles is that they must be intrusive as the alluvial deposits of the top-soil are ‘rock-free’. They were either, therefore, derived from the subsoil clays that may have river deposited material within them, or more likely, given the nature of the raw material, they were brought into the area as material to stabilise road surfaces. Through use of the roads, particularly in wet weather, this material has been pushed down into the soil profile. The clay nodules were probably derived from clay that has been baked as tree roots were burnt during the clearing of the land. None of the clay nodules displayed any indication that they were originally heat retainers from ancient hearths in that they were small and often had root impressions in them. The charcoal, like the clay nodules, was probably derived from the burning of the original vegetation at the time of European settlement. These charcoal fragments were recorded scattered throughout the deposit without any discrete concentrations being noted by the excavators.

Thirteen items were identified during the programme as artefacts. However, 5 items (38% of the total) were, in the cataloguer’s opinion, only of “possible human manufacture”. This determination was reached as the items in question did not clearly display the features of a flake that would make it of indisputable human manufacture. Therefore only 8 items were definitely identified as artefacts of human manufacture (i.e. they display all of the features required on both the ventral and dorsal surface of the flake).

As another aspect of the test excavation programme, a spoil heap was sieved to retrieve cultural material. This spoil heap had been created when a drill pad was cleared in September 2007. The sieving of the spoil heap recovered 23 artefacts, including a greyish green ground-edge hand-axe. Of the 23 artefacts 7 have been listed by the cataloguer as ‘possibly of human manufacture’. In general, the cataloguer noted that many of the artefacts originating from the spoil heap were possibly not of Wiradjuri origin, but were possibly formed as a result of rock crushing (i.e. intrusive material brought in for road construction).

Figure 6: Map showing previously recorded, or newly recorded, sites from Paton's 2006 survey.

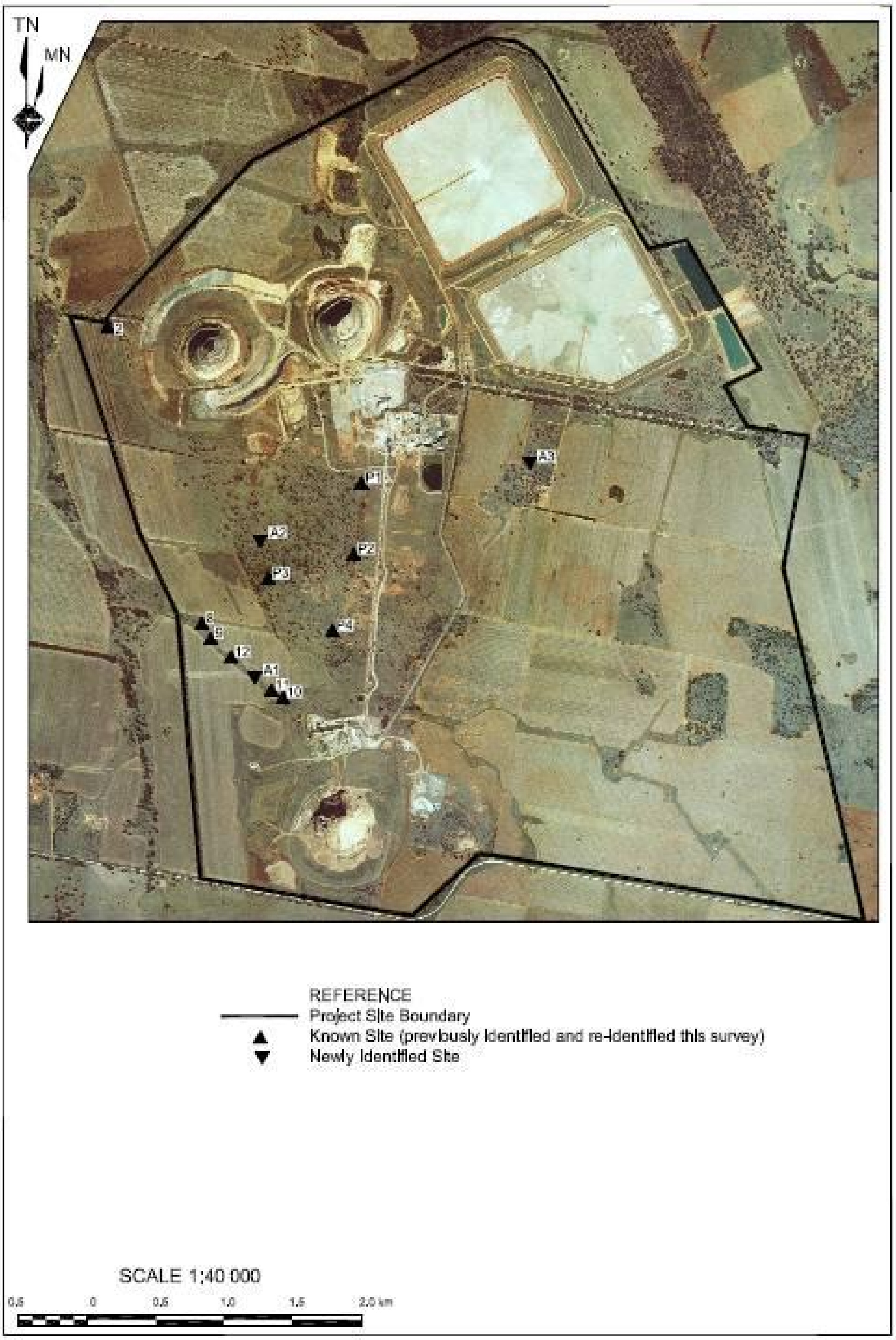
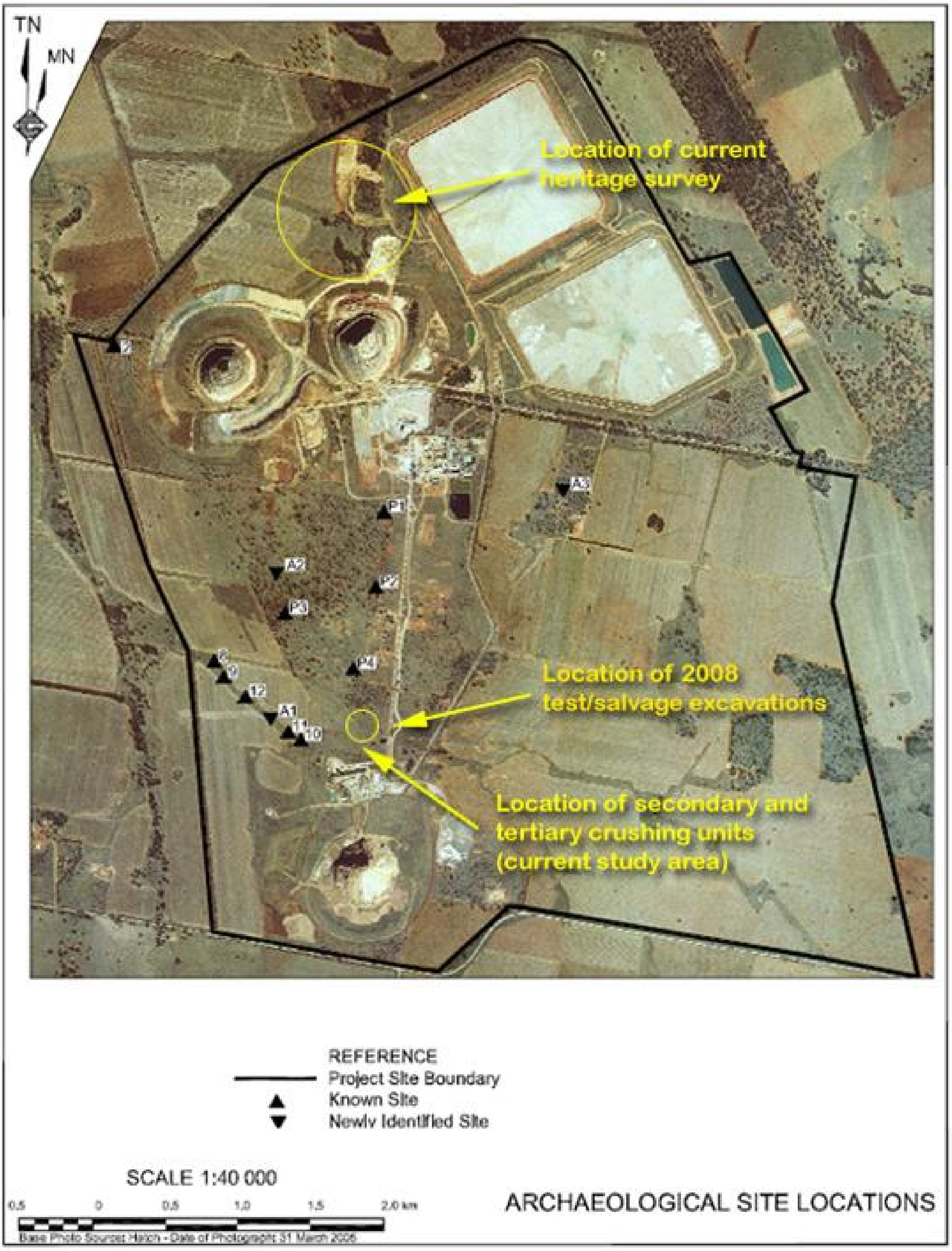


Figure 7: Location of the 2008 test excavation program in relation to the present study area.



4.4 Predictive Model for Site Location

Proximity to a permanent water supply is the primary factor appearing to determine the location of Aboriginal campsites. Results of an integrated series of studies including a serious excavation component, suggests a high correlation between the permanence of a water source and the permanence and/or complexity of the area's Aboriginal occupation (Jo McDonald CHM, 1997). This was further reflected in the lithic assemblages from sites close to permanent water, which suggested that a greater range of activities were represented (e.g. tool use, manufacture and maintenance, food processing, and quarrying). Sites near ephemeral water sources had evidence for one-off occupation (e.g. isolated knapping floors or tool discard), and creek junctions were also proven to be a foci for site activity.

Using the concept of stream ordering, the following general predictions can be made regarding the nature of sites and their location in the current study area (not taking into account factors of site preservation):

- The area surrounding first order streams and headwaters is most likely to contain evidence of sporadic occupation and may consist of little more than a background scatter of artefactual material;
- In the vicinity of second order creeks, archaeological evidence may be sparse, but may indicate focussed activity (one-off camp sites and knapping events);
- In the lower reaches of tributary creeks (third order), archaeological evidence will be more frequent and intense, indicating more permanent or repeated occupation by small groups and may show evidence of concentrated activities;
- On major creek lines and rivers (fourth order) more permanent and repeated occupation may be evidenced by a more diverse stone tool assemblage indicating greater range of lithic activities. Sites in this location may even be stratified;
- Creek junctions may provide a popular location for occupation and the size of the confluence (in terms of stream ranking nodes) may influence the size of the site, and;
- Ridgetop locations between drainage lines are likely to contain limited archaeological evidence in the form of one-off activities.

More specifically, Green (2002) undertook a survey for the Wiradjuri Heritage Study which involved extensive level of consultation with government, non-government and Aboriginal interests in the Wagga Wagga LGA to the south of the present study area. Broadly the study aimed to interpret the findings of archaeological findings from various assessments over the LGA. In relation to predictive models Green (2002: 77), summarises that:

- Quartz is the primary raw material however chert, silcrete, and quartzite are also known to occur;
- Artefact scatters are likely to be located in well drained areas near permanent water sources such as sand hills and creek levees;
- Hearth stones and artefacts are likely to be exposed by erosion at the base of sand dunes and drifts;
- Mussel shell deposits are often associated with ashy grey material and charcoal;

- Burials are usually only detected after disturbance (machine or natural i.e. erosion) but are usually in naturally elevated sand dunes or alluvial landforms;
- Modified trees can occur anywhere but are more common near water;
- The Wiradjuri did not always live in transient camps but often concentrated, continued or repeated activity around certain camp sites and mounds.

The study area would be classified as plains, generally distant from permanent water. Based on the predictive model developed by Green (2002), the review of the topographic, climatic and hydrological features of the study area (Section 3) and a review of other studies undertaken in the regional and local area (Sections 4.2 and 4.3), the following observations of the study area can be made:

- The site type most likely to be recorded would be culturally modified trees, followed by open sites and isolated finds;
- The predominant soils of the study area are clays;
- There are no natural water sources within the study area;
- The study area occupies a relatively dry area with nearly a quarter of the year recording little or no rain;
- There is no outcropping rock within the study area;
- The entire study area has been heavily impacted by European land use inevitably leading to the disturbance of archaeological deposits.

Based on these observations, the following predictions on the possibility of locating certain site types within the study area can be drawn:

- Scarred and/or modified trees may well have once existed in the study area but due to the almost complete clearing of native vegetation, this site type will be rare within the study area today;
- The clay soils of the study area were not preferred camping sites for the former Wiradjuri population. Therefore, open camp sites will be rare;
- As permanent water sources are nonexistent in the study area, the likelihood of recording large base camp type sites would be low;
- The relatively dry climate of this region indicates that major settlement in the past would be closer to permanent water such as the Bogan River;
- Isolated finds can be located in any landscape and therefore there is a chance of recording this site type within the study area;
- The lack of outcropping rock within the study area would preclude shelter, axe grinding and quarry sites;
- Other site types such as stone arrangements and ceremonial sites will have been destroyed by the intensive agricultural land use of the study area and their incidence today will be very rare; and
- Other site types, such as burials, could feasibly exist in the study area; however, the potential is low as the majority of burials in the region have been recorded in areas of soft soil, such as dunes or alluvial terraces, neither of which are present within the study area.

4.5 Survey Methodology

The survey of the study area took place between Tuesday 25 and Wednesday 26 November 2008. Present were Dr Jodie Benton (archaeologist, OzArk EHM), Ms Cheryl Burke (archaeological assistant, OzArk EHM), Mr Robert Clegg, ngangaanha (WCE), Mr Thomas Peckham (PHLALC), Mr Anthony Wilson (PHLALC) and Mr Sean Biden (NPM).

Information and maps supplied by NPM were used to delineate the boundaries of the study area and provide information regarding the nature of the proposed impacts. There was no hindrance to accessing the entire study area.

All areas of the study area as set out in Section 3 were surveyed by pedestrian transects with the surveyors spaced approximately 10–15 m apart.

4.6 Survey Results

One Aboriginal cultural site was recorded as part of the current survey.

NPM ST1 ***Culturally Modified Tree*** ***AGD 597826E 6359342N***

The scar is contained within a dying Grey Box (*E. Microcarpa*) which has a height of approximately 20 m and a trunk diameter of 2.22 m. The scarred trunk is dead. The scar measures 960 x 350 mm and is located 1130 mm from the ground. The scar has a depth of 120 mm. The scar is a symmetrical, ovoid shape orientated to the south-west. There are axe marks present.

Plate 7 shows NPM ST1 in its landscape context and Plate 8 shows the detail of the scar.

No other sites or culturally significant material were recorded as a result of this survey.

Due to the nature of the soil, the distance from permanent water and the high degree of overall disturbance, no areas within the study area were assessed as holding potential to contain further sub-surface archaeological deposits.

The surface crusher operations in the southern portion of the NPM site (Figure 5) are located within Zone 1 (zone of moderate archaeological sensitivity). This zone has been previously surveyed (refer Section 4.3) and management measures currently exist in the AHMP. Accordingly, management recommendations for the surface crusher operations works in Zone 1 will be discussed in Sections 5.3 and 7.0.

5. DISCUSSION

5.1 Aboriginal Site Distribution

Based on the predictive model outlined in Section 4.4, the most likely site type to be encountered within the study area were culturally modified (scarred) trees (where remnant vegetation remained extant), followed by open sites and isolated finds.

To this end it is noteworthy that the predictive model has been shown to be correct as the only site recorded was a culturally modified tree (NPM-ST1).

The lack of other sites can be explained by the distance to permanent water and the absence of rock as well as the high level of disturbance over the study area. Section 3.4 outlines the previous disturbances to the study area which include the clearing of native vegetation, ploughing for crop production, previous mining activities and construction of drainage channels, along with associated agricultural fences, roads etc. Together these disturbances impact almost all of the study area, causing disturbance to any archaeological deposits that may have once been present.

The landform of the study area is mostly comprised of relatively level plains. The preferred occupation areas, as set out in Section 4.3 (terraces and hill spurs close to water), were not present within the study area.

On the basis of these findings, and because the landform of the study area is assessed as having low potential for intact sub-surface archaeological deposits, and if the management recommendations for NPM-ST1 are adhered to (outlined in section 7), there is no impediment to the current proposal on the grounds of local Wiradjuri cultural heritage.

5.2 Aboriginal Site Assessment

The appropriate management of cultural heritage items is usually determined on the basis of their assessed significance as well as the likely impacts of any proposed developments. Cultural, scientific, and public significance are currently identified as baseline elements of this assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

<u>Cultural significance</u>

This criterion involves the importance of a site or feature to the relevant cultural group; in this case the local Wiradjuri community. Aspects of cultural significance include assessment of sites, items, and landscapes that are traditionally significant or that have contemporary importance to the local Wiradjuri community. This importance involves both traditional links with specific areas as well as an overall concern by local Wiradjuri people for their sites generally and the continued protection of these. This type of significance may not be in accord with interpretations made by the archaeologist – a site may have low scientific significance but high local Wiradjuri significance (or *vice versa*).

The significance of the archaeological site located within the study area was addressed during an on-site meeting attended by local Wiradjuri community representatives and at a meeting of the AHWG on Friday 12 December 2008.

<u>Scientific significance</u>

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of significance relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether or not a site can contribute to current research also involves defining 'research potential' and 'representativeness'. Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region?

Regarding scientific assessment, it is difficult to attach great scientific significance to culturally modified trees, particularly scar trees. Site types such as these certainly indicate past occupation of the landscape and they can give an indication of resource use within an area, however, due to wide-spread tree felling, it is impossible to gauge how common or rare these items may have been in pre-European times, particularly in areas such as the present study area where little of the pre-European landscape remains intact. The use of tree bark for food containers is well attested in the ethnographic record and while an isolated example may shed light on past land use, it is not, in itself, sufficient to answer more in-depth scientific questions.

<u>Public significance</u>

Sites that have public significance do so because they can educate people about the past. By reducing ignorance about why sites are important to the Aboriginal and scientific community, important sites can be protected from ignorant or inadvertent destruction. Educating the public to understand the need for site preservation should increase the likelihood of maintaining an archaeological resource into the future. For a site to have high public significance it should contain easily identifiable and interpretable elements, and be relatively easily accessed.

Although culturally modified trees are appreciated due to their obvious visual manifestation, their general significance is reduced by their location and unremarkable characteristics (making culturally modified trees difficult to distinguish from natural scars). Unless a culturally modified tree is in some way outstanding (either in terms of spatial size or decoration) this site type is usually assessed as having low–moderate public significance.

5.2.1 Assessed significance of the recorded Aboriginal site

<u>Cultural</u>

Conversations regarding the significance of the culturally modified tree NPM ST1 were held with local Wiradjuri community representatives on site and at a meeting of the AHWG on Friday 12 December 2008. The significance of the site was assessed as being of **high cultural significance** and of value to the local Wiradjuri community.

<u>Scientific</u>

The scientific assessment of culturally modified trees, as described above, revolves around the known local context of this site type (i.e. are there many, some or no such features known locally). While sections 4.2 and 4.3 indicate that culturally modified trees are the most common site type in the district, they are not so common as to be disregarded. As so many have been presumably destroyed due to land use practices, each example has a role in informing us about past occupation of the landscape and past land use practices. However, from a strictly scientific perspective, site NPM ST1 is assessed as having **low-moderate scientific significance**.

The reasons for this assessment include the fact that the size, pattern and context of the scar is unremarkable and is representative of other site types of its kind that have been recorded in the district. Additionally, no other sites were recorded in close proximity to NPM ST1 which diminishes the potential of NPM ST1 to contribute to current research.

Public

NPM ST1 is assessed as being of **low public significance** as the site is hard to locate and is located on property with restricted public access. Additionally, as set out above, scars such as NPM ST1 are difficult for the layperson to interpret and difficult to distinguish from a naturally occurring scar.

5.3 Management Recommendations: Community and Archaeological

As documented above, NPM-ST1 has been assessed as having high cultural significance and low–moderate scientific and public significance. As noted every site type has the ability to inform the general public, and the local Wiradjuri community in particular, about past occupation and land use practices.

The view of the local Wiradjuri community representatives present on the survey was that they regard NPM ST1 as important in building awareness of the cultural landscape of the NPM area. As such, it is recommended that NPM-ST1 be recorded to archival standards, including a cast of the scar.

It was decided in the field that, as the tree containing the scar is dead (at least the part containing the scar is dead) and the wood is brittle, that moving the trunk containing the scar is not practical as it is likely to disintegrate. Therefore, in lieu of moving the tree, the local Wiradjuri community representatives held that an archival record of NPM-ST1, including a cast, would be appropriate management of the site.

As the project is being assessed under Part 3A of the EP&A Act and is hence governed in terms of Aboriginal heritage management by a ratified AHMP (rather than permits issued by DECC), it is considered appropriate that the AHMP is revised to include the management of NPM-ST1 in relation to the project impacts. This revision is required to be ratified by the AHWG.

Impacts within Zone 1 are covered by management measures within the AHMP. In accordance with the consultation protocol outlined in the AHMP, it was discussed with the AHWG at the meeting on Friday 12 December that specific management of the surface crusher operations would involve local Wiradjuri representation to monitor removal of topsoil material.

6. RELEVANT LEGISLATION

Base line principles for the conservation of heritage places and relics can be found in the Burra Charter[4], which recognises that there are places worth keeping because they can

[4] The Burra Charter defines the basic principles and procedures to be followed in the conservation of all kinds of places such as monuments, buildings, Aboriginal sites, roads, archaeological sites, whole districts or even regions. It was first adopted in 1979, based on the Australian ICOMOS (International Council on Monuments and Sites) review (1977) of the 1966 Venice Charter (Australian ICOMOS Inc. 1998).

enrich our lives on many levels. The significance of such places may be embodied in fabric (physical material), environmental setting, contents, use or its meaning to people, and should be assessed through methodical data collection. Since its adoption in 1979, The Burra Charter has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The Burra Charter generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a State level.

A number of Acts of parliament provide for the protection of Aboriginal heritage at various levels of government (NSW Heritage 1998: 3). The three most important statutes in New South Wales are the:

- *Environmental Planning and Assessment Act 1979* (EP&A Act), amended by the *Environmental Planning and Assessment Amendment (Infrastructure and Other Planning Reform) Act 2005* (EP&AAAct).
- *National Parks and Wildlife Act 1974* (NPW Act).
- *Heritage Act 1977* (H Act).

While at Commonwealth level, the following statutes are relevant:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) amended by the *Environment and Heritage Legislation Amendment Act (no. 1) 2003,* the *Australian Heritage Act 2003* (AHC Act) and the *Australian Heritage Council* (*Consequential and Transitional Provisions*) *Act 2003 (*AHC (CT) Act).

6.1 State Legislation

6.1.1 Environmental Planning and Assessment Act 2005

Amendments were made to the *Environmental Planning and Assessment Act 1979* by the Planning Reform Bill of 2005. Essentially this provides a new method for project assessment that places major infrastructure projects, or those deemed to be of state significance as defined in Schedule 1 of the *State Environmental Planning Policy (Major Projects) 2005,* under Part 3A of the Act.

Under Section 75U of *The Environmental Planning and Assessment Act 2005* (EP&A Act), if the current project is granted project approval under Part 3A of the EP&A Act, the following approvals, which may have otherwise been relevant, will not be required to carry out the Project:

- *Heritage Act 1977*: Disturbance to an item listed on the State Heritage Register or Interim Heritage Order – Excavation Permit; and

- *National Parks and Wildlife Act 1974*: A section 87 preliminary research / collection permit; or section 90 consent to destroy relics.

Although the provisions of other relevant Acts, including the *National Parkes and Wildlife Act 1974,* do not apply for developments assessed under Part 3A of the EP&A

Act, their intent has been considered and remains part of the assessment requirements, with independent expert panels being utilised to assess the veracity of environmental assessment reports. Under Part 3A, the Section 87 and 90 permits that are required for impacts to Aboriginal heritage under the NP&W Act, are not required for projects assessed under Part 3A. Instead, a Statement of Commitments in terms of heritage is presented within 3A applications, which then form the basis for the Minister’s approval which will usually contain a series of Conditions, including a requirement for the preparation of an Aboriginal Heritage Management Sub Plan as part of the Construction Environment Management Plan for the Project. These conditions include similar checks and balances as required by the NP&W Act, such as test excavation programmes or site destruction mitigation development etc. as is currently required under the permitting process, however, without the need to obtain permits.

6.1.2 Application to the study area

As the existing development consent is for a mining project as defined in Schedule 1 *State Environmental Planning Policy (Major Projects) 2005*, it has been previously assessed under Part 3A of the EP&A Act and the proposed modifications to this development consent will be determined by the Minster for Planning. An update to the existing AHMP is to be undertaken to manage impacts to Aboriginal site NPM-ST1.

6.2 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects the environment, particularly matters of National Environmental Significance. It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places. Under the EPBC Act, definitions of the “environment” include the following:

- Ecosystems and their constituent parts, including people and their communities;
- Natural and physical resources;
- The qualities and characteristics of locations, places and areas;
- Heritage values of places; and,
- The social, economic and cultural aspects of a thing mentioned in the above points.

There are seven matters of National Environmental Significance under the EPBC Act:

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance (Ramsar Wetlands);
- listed threatened species and ecological communities;
- listed migratory species;
- the Commonwealth marine area; and,
- nuclear actions, including uranium mining.

The EPBC Act provides that any action assessed as likely to have a significant affect on these listed matters of national environmental significance is to be known as a *controlled action*, and may only proceed with the Minister of the Environment's approval.

In January 2004 changes to the protection of national heritage came into effect through amendments to the EPBC Act and through the passing of the AHC Act and the AHC (CT) Act. The first was covered above; where National Heritage places joined the previous six listed Matters of National Environmental Significance.

The AHC Act provided for the establishment of the Australian Heritage Council (AHC), an independent advisory body to the Commonwealth Minster for the Environment and Heritage. This body replaces the earlier Australian Heritage Commission, established in 1975 under the *Australian Heritage Commission Act 1975* (AHC Act 1975). The register of heritage places set up under the AHC Act 1975, known as the Register of the National Estate (RNE), is retained under the new AHC Act, but it is noteworthy that this list provides no specific legislative protection, although listing on the RNE recognises the heritage values of such places.

The AHC (CT) Act repeals the AHC Act 1975 and provided amendment to various Acts, allowing a transitional period for establishment of the National Heritage List (NHL) and the Commonwealth heritage List (CHL).

6.2.1 Application to the study area

No items within the study area are listed on the Register of the National Estate, the National Heritage List or the Commonwealth Heritage List.

7. RECOMMENDATIONS

Under Section 91 of the NPW Act (1974 as amended) the Director-General of the NSW DECC must be notified of the location of all Aboriginal objects. These sites are then registered on the Aboriginal Heritage Information and Management System (AHIMS). As a professional in the field of cultural heritage management, it is the responsibility of OzArk EHM to ensure this process is undertaken.

To this end it is noted that one Aboriginal site (NPM-ST1) was recorded as part of the survey and a site card for this modified tree will be forwarded to the DECC.

The following recommendations are made on the basis of:

- Legal requirements under the terms of the National Parks and Wildlife Act of 1974 (as amended) whereby it is illegal to damage, deface or destroy an Aboriginal relic/object without the prior written consent of the Director, NPWS;
- The findings of the investigations undertaken within the study area; and,
- The interests of the PHLALC and WCE.

It is recommended that:

1. NPM-ST1 is to be recorded to archival standards. As any decision to move the tree to a secure location will likely result in its disintegration. This recording should include a full photographic record (on film in both black/white and colour), accurate measurements and descriptions, and a cast of the scar.
2. The AHMP is revised to include reference to the identified Aboriginal site NPM-ST1 and the implementation of management measures as identified in recommendation (1).
3. Specific management of surface crusher operations within Zone 1 will involve local Wiradjuri representation to monitor removal of topsoil material.
4. Should any 'relics' or other Aboriginal materials / sites be identified anywhere in the study area during the course of construction, work in that area should cease and the AHWG and the DECC Northwest Office be contacted to discuss how best to proceed.
5. One copy of this report should be sent to the following Aboriginal communities:

Peak Hill LALC, Chairperson	Wiradjuri Council of Elders
Local Aboriginal Land Council	Flo Grant - Chairperson
88 Caswell Street	PO Box 8565
PEAK HILL NSW 2869	Kooringal NSW 2650

6. Two copies of this report should be sent to:

The Cultural Heritage Division
AHIMS Register DECC
PO Box 1967
HURSTVILLE NSW 2220

8. REFERENCES

Appleton, J., 2000 *The report of the archaeological investigation of the mine site and sites of associated ancillary infrastructure for the Syerston Nickel-Cobalt Project, Condobolin/Fifield area, Western NSW*. Report to Resource Strategies for Black Range Metals Ltd.

Appleton, J., 2002 *The archaeological investigation of the site of a proposed feedlot at Kiacatoo west of Condobolin, Central-West NSW*. Report to E.A. Systems Pty Ltd for Rockdale Beef Pty Ltd.

Australian ICOMOS Inc. 1998 *Understanding the Burra Charter: A guide to the principles of heritage conservation in Australia*. Brochure produced for Australia ICOMOS.

Australian Museum 2008 *Wellington Gas Pipeline, Power Station and Compressor Station: Heritage Survey and Assessment*. Report to ERM Power.

Bowdler, S. 1983 *Aboriginal sites on the Crown timber lands of NSW*. Report to the Forestry Commission of NSW.

ERM 2006 *Proposed Ethanol Production Facility at Condobolin*. Report for Agri Energy Ltd.

Flood, J. 1995 *Archaeology of the Dreamtime*. Angus & Robertson: Sydney.

Green, D. 2002 *Wiradjuri Heritage Study for the Wagga local government area of NSW*.

Jo McDonald CHM 1997 *Interim Heritage Management report: ADI Site St Marys. Volume 1*. Report to Lend Lease.

Kabaila, P.R., 1997 *Wiradjuri Places: The Lachlan River Basin* Black Mountain Projects, Canberra.

Kass, T. 2003 *Parkes Shire Thematic History*. Report to Parkes Shire Council.

Koettig, M. 1985 Assessment of Aboriginal sites in the Dubbo City area. Report to Dubbo City Council.

Maynard, L. *Aboriginal Sites*. NPWS Brochure Publication.

Mitchell, P. 2008 *Geomorphic and pedological context of the Aboriginal archaeological survey on Goonumbla Creek at NorthParkes Mines*. Report to OzArk (contained within OzArk 2008c.

OzArk 2008a (OzArk EHM P/L) *Indigenous Heritage Review: Northparkes Mine, near Parkes, NSW*. Report for NPM.

OzArk 2008b (OzArk EHM P/L) *Heritage Assessment: Corridor Options for the proposed Manildra-Parkes 132kV ETL, NSW*. Report for URS Australia on behalf of TransGrid.

OzArk 2008c (OzArk EHM P/L) *Test/Salvage Excavation Program. Northparkes Mines, Parkes NSW*. Report to Northparkes Mines.

Paton 2006 (Australian Archaeological Survey Consultants) *Aboriginal Heritage Assessment of the Northparkes Mines - E48 Project*. Report to North Mining Ltd.

Pearson, M. 1981 *Seen through different eyes: changing land use and settlement patterns in the Upper Macquarie River region of NSW from prehistoric times to 1860*. PhD Thesis, Department of Prehistory and Anthropology, Australian National University, Canberra.

R.W.Corkery 2006 Northparkes Mine E48 Development – Environmental Impact Assessment. Report to Northparkes Mines

Sullivan, S. and Bowdler, S. 1984 *Site surveys and significance assessment in Australian Archaeology* ANU, Canberra.

Tindale, A. 1974 *Aboriginal Tribes of Australia*. University of California Press.

Unger, L.A. (no date) *Aboriginal activity in the Parkes district*. Parkes & District Historical Society.

URS 2006 (URS P/L) *Environmental Assessment for the Parkes Peaking Power Plant*. Report to International Power.

Whitehead, J. 2003 “Tracking and Mapping the Explorers” Volume 1 *The Lachlan River Oxley, Evans, and Cunningham*. Southern Cross University Printery: Lismore.

APPENDIX 1: PLATES

Plate 1: View of remnant woodland within Area 1 of the study area.

Plate 2: View of artificial disturbances within Area 2 of the study area.

Plate 3: A view of Area 3 of the study area showing the cleared nature of the land and artificial disturbances from agricultural land use.

Plate 4: A view of Area 4 of the study area showing the cleared nature of the land.

Plate 5: Portions of Area 4 of the study area exhibited disturbance from mining related activities. In this case wash from mining operations has covered the land surface obscuring a clear view of the original ground surface.

Plate 6: A view of Area 5 of the study area showing the largely cleared nature of this area.

Plate 7: View of the Culturally Modified Tree, NPM-ST1, located in a Grey Box. Mr Robert Clegg provides scale.

Plate 8: Detail of NPM-ST 1.

APPENDIX 2: EOI ADVERTISEMENTS AND CORRESPONDENCE

Expression of Interest Advertisement – Parkes Champion Post, 3rd November 2008.

Webb Street at the intersection with Clarinda Street and Peak Hill Road.
Traffic conditions will also vary along Clarinda Street and Peak Hill Road from Mitchell Street to Webb Street to allow for rehabilitation of the wearing course on the Newell Highway. The works will be from 11 to 19 November, 2008.
Council apologises for any inconvenience.
A. McCormack
General Manager.
n3-7

OzArk Environmental & Heritage Management P/L is seeking Expressions of Interest from relevant Aboriginal groups or individuals interested in being consulted regarding cultural heritage assessment of an area on Northparkes Mines, near Parkes, that is to be the subject of development. Written submissions should include: detail on whom you or your group represents; the basis of cultural interest in the subject area and experience / capability in the assessment of cultural heritage. Alternatively, interested parties can phone OzArk between 9.00am and 5.00pm week days, on (02) 6882 0118 to register their interest. Written submissions should be addressed to

OzArk EHM
PO Box 2069
Dubbo, NSW, 2830

And be received no later than
Monday 17th November 2008

Indigenous Land Corporation
GPO Box 5212
BRISBANE QLD 4001

by 5pm on Friday 12 December 2008.

about playing at Melbourne Park instead of Parkes tennis courts last week. Marc won their match 5/2.
Jordan Hewes and Abraham Clinch both hit the ball well in their match in which Jordan scored a 5/2 win.
Carleton Magill came from behind last week to finish just one game ahead of Bryce Taylor after Bryce lead early in the match. Both boys were trying very hard and played some nice rallies.
GREEN-
Jack Pascoe outscored Lachlan Campion by just one last week to take the winners points while Tiffany Cook continues to have the wood on the boys and scored another win with an impressive 4/1 scoreline against Isaac Clinch.
Judd Clinch decided he would score a win for the family and did so with a close 4/2 victory over Erica Wright.
Emilie Rogers and Isabelle Evans didn't look to be too enthusiastic last week in their match in the hot sun. Em won 4/2.
ORANGE-
Amanda Berger was on fire last week when she played Emily Thomson. Em did a lot of running for her single game.
Rachael Westcott proved her form last

Ryan.
Mihran Sarkissian and Nathan Wright were both beaming with confidence last week when they walked onto the court. Neither player was able to grab the ascendancy though and the match finished in a 3 all draw.
FEDERERS DOUBLES DIVISION-
An impressive scoreline from Perry Cabban and Matthew Job last week with a comfortable three sets to nil win over Emily Patton and William Olson.
Scott Chislett and Joel Thomson showed their experience last week with a three sets to 0 win while Maddye Potts and Rachel Job showed the girls can win matches when they defeated Matty Ellery and Mitch Miles 2 sets to 1.
Maddi Cook and Taylah Smede continued the girls winning run when they proved too good for Cooper Byrnes and Tom Barker with a 3 sets to 0 win.
NADALS DOUBLES DIVISION-
Emilie Noakes and Bec Kiley showed all their extra practice is paying off with a smart 3 sets to 0 win. Thomas Day and Alex Young also scored a straight sets win over India Hayes and Kelly Wray to wrap up round three of junior comp.

WELL DONE: the under 6 soccer Billabong Panthers had a great soccer season this year. Back - Ashleigh Ward, Clancy Pascoe, Lachlan Hando, Harrison MacGregor, Ella Morrissey, Annalise Maier, Jack Woods; front - Melanie Reeves, Kaitlyn Klien, Cassandra Ward, Jackson Guy, Eden Lydford. sub

Life is local

PARKES CHAMPION POST Monday, November 3, 2008 17.

Expression of Interest Advertisement – The Weekend Australian, 1st November 2008

THE AUSTRALIAN
THE WEEKEND AUSTRALIAN

OzArk Environmental & Heritage Management P/L is seeking Expressions of Interest from relevant Aboriginal groups or individuals interested in being consulted regarding cultural heritage assessment of an area on Northparkes Mines, near Parkes, that is to be the subject of development. Written submissions should include: detail on whom you or your group represents; the basis of cultural interest in the subject area and experience / capability in the assessment of cultural heritage. Alternatively, interested parties can phone OzArk between 9.00am and 5.00pm week days, on (02) 6882 0118 to register their interest. Written submissions should be addressed to:
OzArk EHM
PO Box 2069
Dubbo, NSW, 2830
And be received no later than Friday 14th November 2008

33169

Correspondence from GHD Sydney to Department of Planning.

24 October 2008

Department of Planning
Bridge Street Office
23 – 33 Bridge Street
GPO Box 39
SYDNEY NSW 2001

Attention: Kane Winwood,

Section 75W Modification for Northparkes Mines (06-0026 MOD 1)
Indigenous Heritage Assessment

Dear Kane

I refer to your correspondence dated 26 September 2008 regarding the Director-General's requirements (DGRs) for the environmental assessment of the proposed modifications at Northparkes Mines.

The DGRs provide very general guidance for the purpose of the Aboriginal Heritage assessment, noting that the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment are to be used. This usually, by default, includes adherence to the Department of Environment and Climate Change (DECC) Interim Community Consultation Requirements (ICCR's), although these relate specifically to Parts 4 and 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

As the entire ICCR process was undertaken at the outset of the original assessment in 2006 for the existing approval, Northparkes Mines are seeking dispensation from the requirement to undertake this entire process again. Justification for this approach is evident in the following:

a review of the Indigenous community consultation undertaken to date;

an already established and functional Aboriginal Heritage Working Group; and

recent discussions with the DECC Regional Archaeologist, Maria Cotter[1], whom concurred that the approach is sound.

At the time of the original assessment for the E48 project, the full ICCR process was completed as identified in the Northparkes Mines – E48 Project Environmental Assessment. This resulted in the identification of two community stakeholder groups – the Peak Hill Local Aboriginal Land Council (PHLALC) and the Wiradjuri Council of Elders (WCE).

Under Condition 28 of Project Approval 06-0026, Northparkes Mines was required to prepare and implement an Aboriginal Heritage Management Plan (AHMP) to the satisfaction of the Director-General. Throughout 2007, in accordance with the approval, the AHMP was developed in consultation with the

Indigenous community groups and DECC and approved by the Director-General on 5 May 2008. The consultation protocol that Northparkes will undertake is outlined in Section 7 of the approved AHMP.

An Aboriginal Heritage Working Group (AHWG) has been established in accordance with Section 7 of the AHMP. The AHWG consists of two representatives from PHLALC, WCE and Northparkes Mines. The Working Group has met on a regular basis over the past year[2], with four meetings held to date and another meeting scheduled for Monday 27 October.

A primary focus of the AHWG is to create a forum for consultation regarding Northparkes obligations in respect of Aboriginal cultural heritage management. Furthermore, the AHWG has successfully completed the management of a test excavation programme required as part of the AHMP.

In consideration of the above and the ICCRs, the following methodology for Indigenous community consultation is recommended:

The project modification is tabled at the forthcoming AHWG meeting on Monday 27 October. An assessment approach is developed and agreed upon within that forum that meets all DECC reporting requirements.

As a precautionary principle, an advertisement is placed in the local print media over a two week period. This will ensure that any other Indigenous community stakeholders that would like to be included in the consultation process have the opportunity to register their interest.

It would be appreciated if you could provide confirmation that the methodology outlined above meets Director-General requirements for Indigenous community consultation.

Yours faithfully

GHD Pty Ltd

David Chubb
Manager, Environmental Planning
02 9239 7387

----- Forwarded by Daniel C Mees/Orange/GHD/AU on 06/11/2008 04:34 PM -----

"Kane Winwood" <Kane.Winwood@planning.nsw.gov.au>
06/11/2008 04:22 PM

To <daniel.mees@ghd.com.au>

cc

Subject Northparkes Modification - Aboriginal Consultation

Repository: 2117903 "Section 75W Modification for NPM"

Daniel,

As discussed, given my understanding that:

- the proposal is for a modification to a project which followed the relevant consultation guidelines during the initial assessment;
- the company is consulting with the appropriate groups that were identified in the initial process, as well as the DECC; and
- the community is given the chance to provide input into the assessment process,

I am comfortable with your proposed approach viz not implementing the full consultation guidelines for the modification.

Regards,
Kane

Kane Winwood
Senior Planning Officer
Major Development Assessment

NSW Department of Planning
23-33 Bridge Street, Sydney NSW 2000 / GPO Box 39 SYDNEY NSW 2001
ph 9228 6298 - fax 9228 6466 - mob 0434 967 285
kane.winwood@planning.nsw.gov.au

Appendix F

Flood Impact Assessment

Northparkes Mines

Report for NPM Section 75W Modification

Goonumbla Creek Flood Study

December 2008

Contents

Table Index

Appendices

1. Introduction

1.1 Background

GHD was engaged to investigate the flooding conditions surrounding the proposed location of a secondary and tertiary crusher installed by North Parkes Mine adjacent to Goonumbla Creek. The location of the proposed work is approximately 2 km upstream of the confluence of Goonumbla Creek with the Bogan River.

The objective of this study is to determine the extent and depth of flooding at the proposed works for a 1 in 100-year ARI storm event. The following steps were taken:

» Undertake hydrologic modelling of the catchment to determine the flood peak for the 1 in 100-year ARI storm event; and

» Develop a one-dimensional hydraulic model for the vicinity of the proposed crushers, to calculate flood extent, depth and flow velocity.

1.2 Catchment Area

The catchment area of the creek upstream of the site extends upstream to Goonumbla Hill and Bogan Rd and is approximately 17 square kilometres in area. Two tributaries of Goonumbla Creek converge approximately 1 km upstream of the proposed works. The South-East branch captures runoff from as far as Goonumbla Hill. The Easterly branch captures runoff from as far as Bogan Rd.

The terrain is gently sloping with slopes ranging from 0.5% to 2% with the exception of Goonumbla Hill.

1.3 Available Data

The following data was available for the study:

» Aerial imagery of the Northparkes Mine site;

» 1 m contours for the area in the vicinity of NPM. The imagery and contours show the proposed works but do not extend to the upper areas of the catchment. In this region a NSW topographic map was used to determine runoff and surface roughness;

» Location plans of the proposed secondary and tertiary crusher layout; and

» Secondary Crushing Plant drawings prepared by GW Engineers. These drawings were used to determine the location and elevation of the crushers. The elevation of the base of the crushers was estimated to be 280.6m from the drawings.

1.4 Climate Change

It is widely accepted that rainfall intensities will increase, resulting in higher peak flows and volumes on account of climate change. The effects of climate change have not been considered in this report, however it is advised that climate change be assessed at the detailed design stage.

2. Hydrological/Hydraulic Simulations

2.1 Hydrology

A RAFTS model was established for the catchments draining to NPM. The model was used to estimate peak flow for the Australian Rainfall and Runoff 100-year ARI design storm event. Parameters such as slope, catchment area, impervious area and rainfall losses were used to describe the catchment response to the rainfall event in order to generate design peak flows.

The lag time between sub-catchments within the overall catchment was determined from the local gradient. As the catchment is of a mild gradient all flow velocities were assumed to be less than 1 m/s. A Manning's surface roughness coefficient from 0.035 to 0.05 was adopted, corresponding to medium pasture and partial vegetation respectively.

The initial and continuing loss parameters are shown in Table 1 below as estimated from Australian Rainfall and Runoff. As the catchment is rural the impervious portion of the catchment was taken as 5%.

Storm durations of 25 minutes to 9 hours were simulated using the RAFTS model. The 3 hour storm resulted in the largest flow at the location of the proposed works. The flow at this location was calculated as 50 m^3/s.

Detailed output from the RAFTS simulations are provided in Appendix B.

Table 1 Initial loss/Continuing loss Parameters

Initial loss (mm)	20
Continuing loss (mm/hr)	3

2.2 Hydraulics

A HEC-RAS one-dimensional model was established to:

» Simulate existing conditions at the site, without the proposed crushers; and

» Developed conditions, with the proposed crushers and associated fill platform protruding on the edge of the floodplain.

The upstream extent of the HEC-RAS model was located near the confluence of the Eastern and South-Eastern branches of Goonumbla Creek. The model extended to approximately 1.3km downstream of the proposed works.

The proposed culverts (9 barrels of 3.3w x 1.2h) at the location of the proposed works were modelled using details shown in the drawings developed by GW Engineers.

Culverts upstream of the proposed works such as the culverts under the existing conveyor and under the existing access road were not modelled. For these culverts it was assumed that the structures in place would be overtopped for a 100-year ARI event.

Values of Manning's surface roughness parameter adopted for the model are shown in Table 2 below.

Table 2 Manning's n values used in the HEC-RAS Model

Channel flow	0.06
Overbank flow	0.10

The flows determined from the RAFTS model, along with cross-sectional data obtained from the 1 m contours were input into the HEC-RAS model. A normal depth boundary condition was assumed as downstream control. The model then simulated flood depths at the cross-section locations. This information was used to show flood extents at the proposed works for the 1 in 100-year ARI storm event.

2.3 Results

Flood mapping is provided in Appendix A, while detailed HEC-RAS output is provided in Appendix C. Referring to the appendices, the results from the simulations showed that:

- The proposed works would be located approximately 1.2m above the 100-year ARI event flood levels;
- Under existing 100-year ARI event conditions flow depths would be approximately 350mm corresponding to a flood level of 279.85m RL, at the location of the proposed works. Average flood velocity would be approximately 0.55m/s;
- Under developed conditions the average flow velocity in the proposed culverts adjacent to the proposed works would be approximately 2 m/s;
- The construction of the crusher and the adjacent culvert and embankment structures results in an increase in the 100-year ARI event flood level of 450 mm at the location of the proposed works;
- It is recommended that suitable armouring of the fill platform supporting the crusher and the creek at the culvert crossing be provided, to prevent erosion during flood events. This armouring could comprise rock protection or other environmentally sympathetic measures.

Appendix A shows the 100-year ARI event flood extents for the overall site and the effect of the crusher on the flood extents, for the immediate vicinity of the proposed works.

Appendix C shows the detailed results of the HEC-RAS hydraulic model at each of the modelled cross- sections, provides a long-section and detailed tabular results.

3. Conclusions

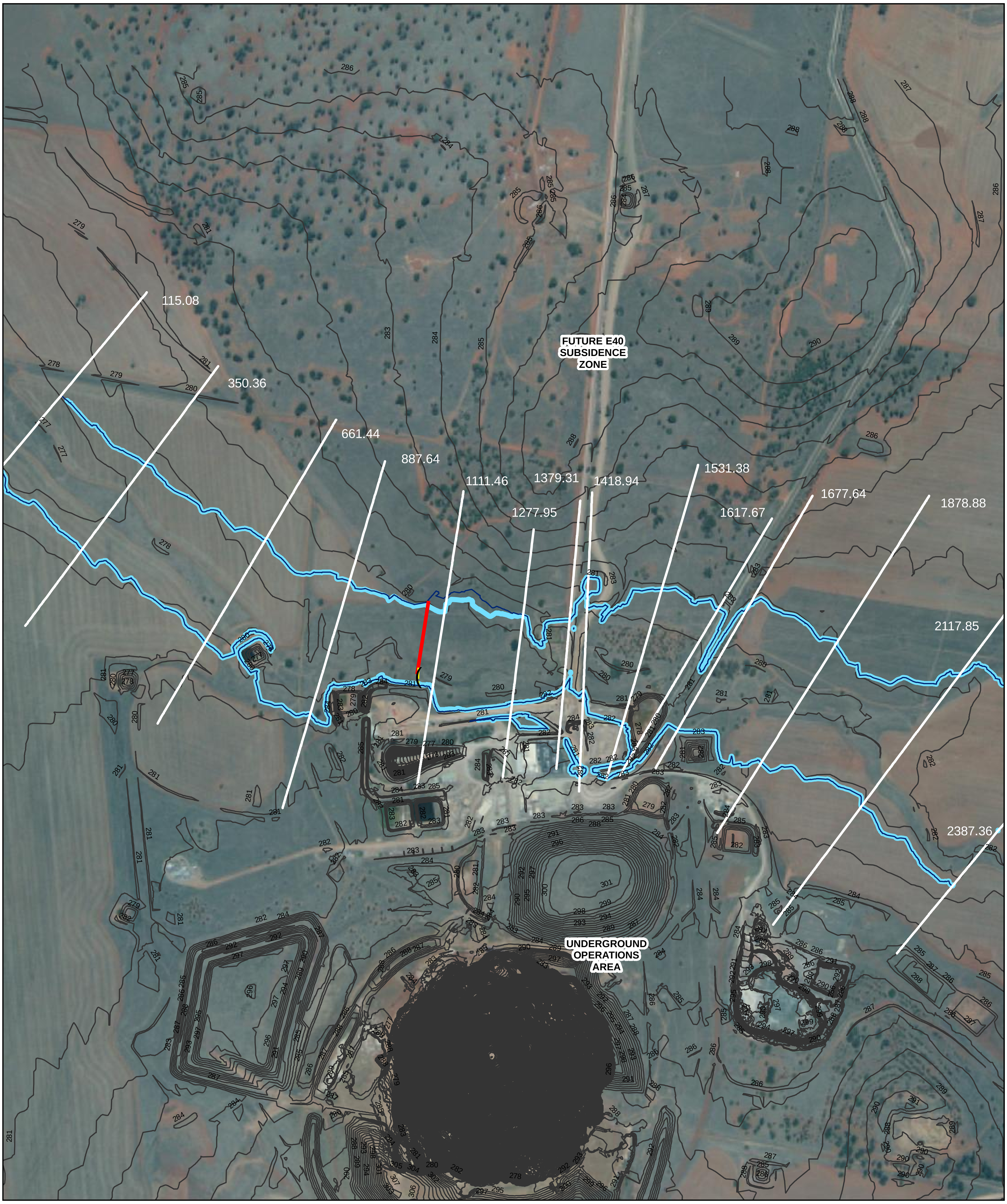
The findings of the study are summarised below:

» The proposed works are located above the flood extents of the 1 in 100-year ARI storm event.. The proposed crusher, culverts and embankment would increase flood depths by approximately 450 mm to a flood level of 280.30m RL, at the location of the proposed works. Average flood velocity would be approximately 2 m\s in the proposed culverts. The level of the proposed work is located above the 1 in 100-year ARI event, with provision of a suitable freeboard; and

» It is recommended that suitable armouring of the fill platform supporting the crushers and the creek at the culvert crossing be provided, to prevent erosion during flood events. This armouring could comprise rock protection or other environmentally sympathetic measures.

Appendix A:

Flooding Maps



LEGEND

Crusher Location	HEC-RAS Cross Sections	Pre-Development 100yr ARI Flood Extent
Culverts and Embankment Location	Post-Development 100yr ARI Flood Extent	Site Coutours

1:7,500 (at A3)

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

CLIENTS | PEOPLE | PERFORMANCE

Northparkes Mines
Section 75W Modification for NPM

Goonumbla Creek Flood Study
Extent of Flooding

Job Number	21-17903
Revision	A
Date	22 DEC 2008

Appendix A

G:\21\17903\CADD\GIS\MapDocument\Z011_Flooding.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON, rgtowner

Appendix B
RAFTS Detailed Results

RAFTS Results Summary

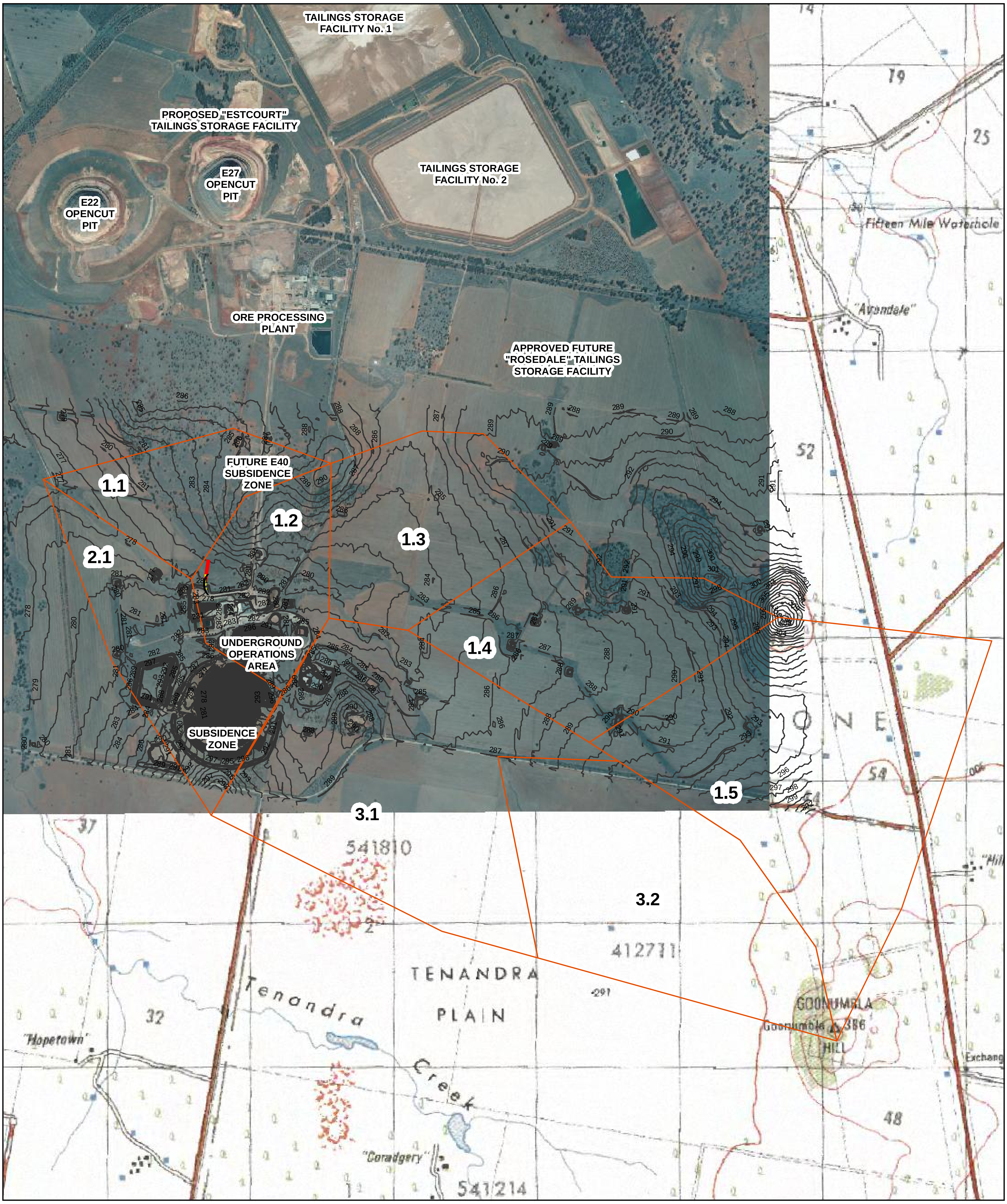
Project: Goonumbla Creek Flood Study

Location: Goonumbla Creek

Job no: 21/17903

100-yr ARI

Node	Max	Peak Flow (m^3/s)								
		25 min	0.75hr	1hr	1.5hr	2hr	3hr	4.5hr	6hr	9hr
1.5	**15.66**	5.204	9.437	12.056	14.268	15.662	15.641	14.937	14.182	10.34
1.4	**23.02**	7.747	14.052	17.95	20.944	22.693	23.018	22.11	21.149	15.34
1.3	**27.66**	9.141	16.589	21.117	24.674	26.821	27.659	26.797	25.787	18.581
3.2	**9.00**	2.699	5.035	6.344	7.622	8.496	8.995	8.769	8.582	6.055
3.1	**19.82**	5.9	10.986	13.982	16.665	18.44	19.819	19.43	19.046	13.734
Conf	**47.44**	15.04	27.565	35.024	40.984	44.868	47.438	46.224	44.808	32.039
1.2	**50.36**	16.734	30.317	38.002	43.734	47.744	50.36	49.143	47.78	34.175
1.1	**52.55**	17.723	31.898	39.845	45.7	49.9	52.546	51.477	50.179	36.009
2.1	**4.61**	1.412	2.568	3.227	3.858	4.323	4.609	4.503	4.408	3.122
Outlet	**55.88**	19.093	34.273	42.648	48.716	53.193	55.875	55.075	53.866	38.852



LEGEND

Crusher Location	Goonumbla_Creek_Subcatchments
Culverts and Embankment Location	Site Coutours

1:25,000 (at A3)

0 85 170 340 510 680

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

GHD

CLIENTS | PEOPLE | PERFORMANCE

NORTHPARKES

Northparkes Mines
Section 75W Modification for NPM

Goonumbla Creek Flood Study
Subcatchments

Job Number	21-17903
Revision	A
Date	22 DEC 2008

Appendix B

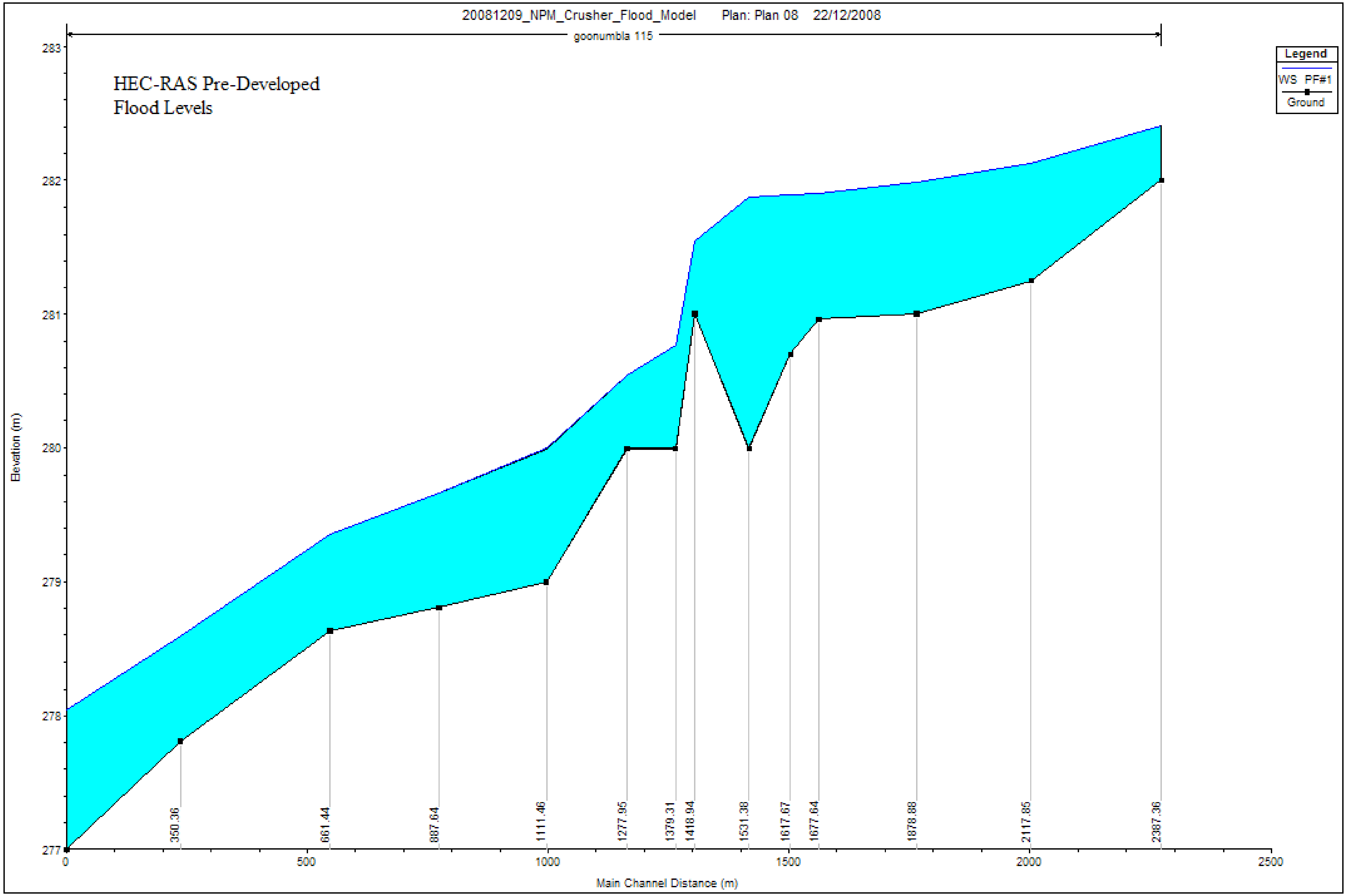
G:\21\17903\CADD\GIS\MapDocument\Z011_Flooding.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON, rgtowner

Appendix C

HEC-RAS Detailed Results


20081209_NPM_Crusher_Flood_Model Plan: Plan 08 22/12/2008
goonumbla 115
HEC-RAS Pre-Developed
Flood Levels
Legend
WS PF#1
Ground
Elevation (m)
283
282
281
280
279
278
277
350.36
661.44
887.64
1111.46
1277.95
1379.31
1418.94
1531.38
1617.67
1677.64
1878.88
2117.85
2387.36
0
500
1000
1500
2000
2500
Main Channel Distance (m)

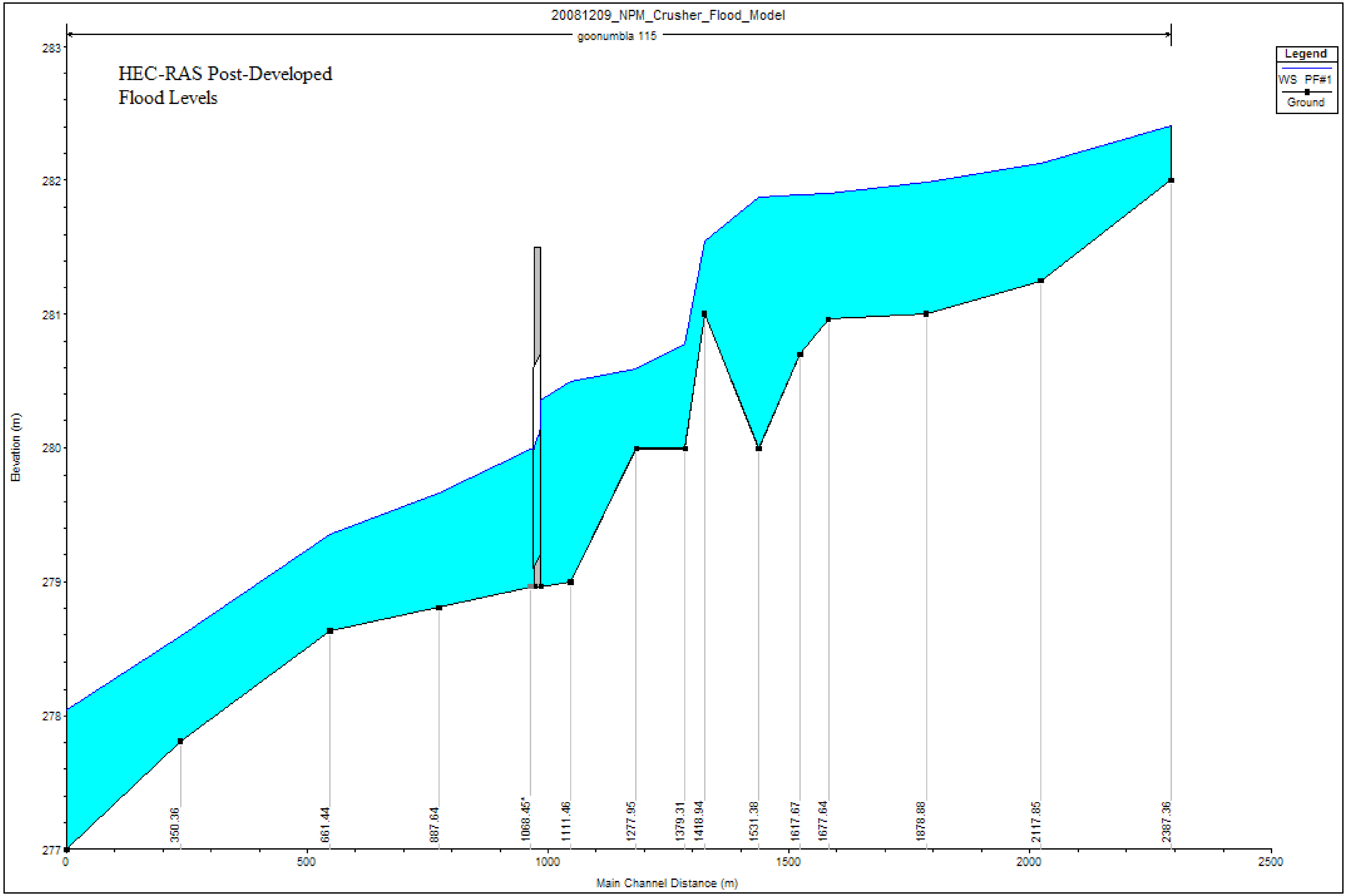
HEC-RAS Results - Pre-Development

Project: Goonumbla Creek Flood Study

Location: Goonumbla Creek

Job no: 21/17903

Cross-Section	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude Number
	(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
2387.36	19.5	282	282.4	282.17	282.41	0.002777	0.42	47.14	149.94	0.23
2117.85	47.5	281.25	282.13		282.13	0.000763	0.34	154.68	346.08	0.14
1878.88	47.5	281	281.99		281.99	0.000486	0.33	173.59	297.37	0.11
1677.64	49	280.96	281.9		281.91	0.000349	0.29	197.17	300.01	0.1
1617.67	49	280.7	281.89		281.89	0.000199	0.26	312.89	396.27	0.08
1531.38	49	280	281.88		281.88	0.000099	0.23	300.85	296.76	0.06
1418.94	49	281	281.55	281.55	281.81	0.045022	2.28	21.5	41.4	1.01
1379.31	49	280	280.77	280.29	280.79	0.001593	0.55	95.83	143.12	0.2
1277.95	49	280	280.55	280.23	280.56	0.00319	0.62	90.43	183.58	0.27
1111.46	50	279	280	279.6	280.02	0.003326	0.69	78.78	168.24	0.28
887.64	50	278.81	279.66		279.67	0.000928	0.39	150.42	291.13	0.15
661.44	53	278.63	279.35		279.37	0.002085	0.55	112.05	250.97	0.22
350.36	53	277.81	278.59		278.61	0.002836	0.68	103.8	224.98	0.27
115.08	56	277	278.05	277.59	278.07	0.002	0.59	104.6	199.96	0.22



20081209_NPM_Crusher_Flood_Model
goonumbla 115
HEC-RAS Post-Developed
Flood Levels
Legend
WS PF#1
Ground
Elevation (m)
283
282
281
280
279
278
277
350.36
661.44
887.64
1068.45*
1111.46
1277.95
1379.31
1418.94
1531.38
1617.67
1677.64
1878.88
2117.85
2387.36
0
500
1000
1500
2000
2500
Main Channel Distance (m)

HEC-RAS Results - Post-Development

Project: Goonumbla Creek Flood Study

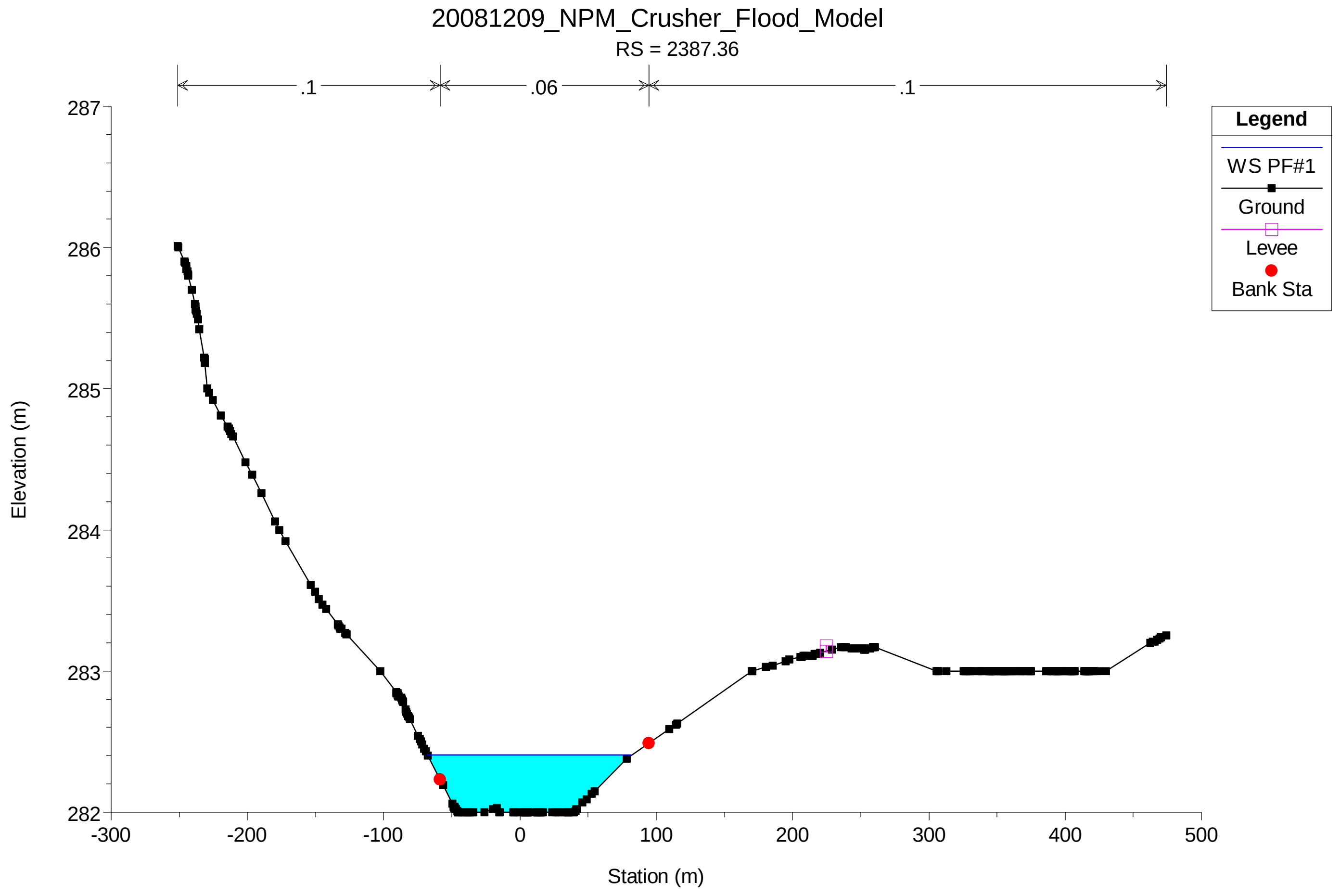
Location: Goonumbla Creek

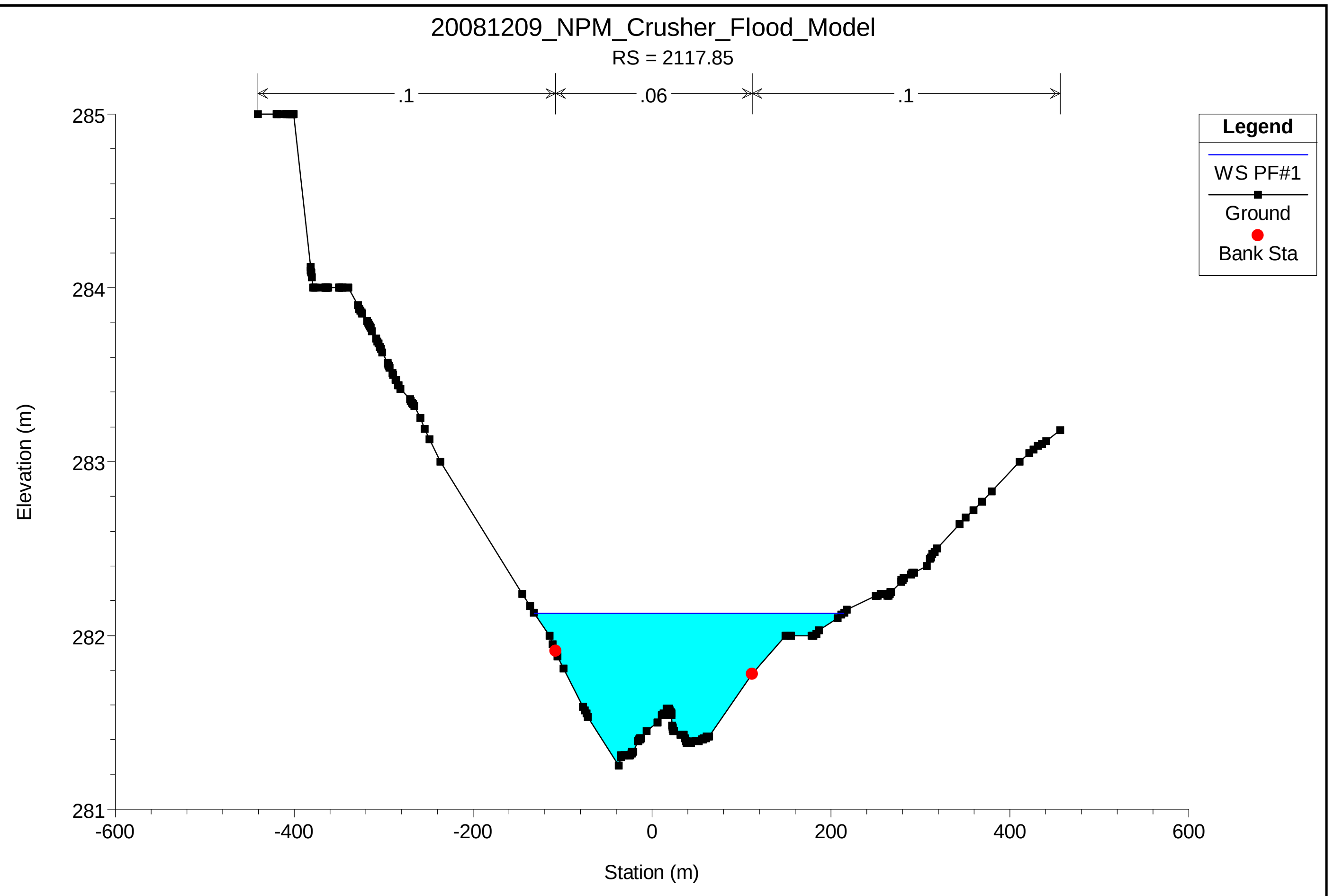
Job no: 21/17903

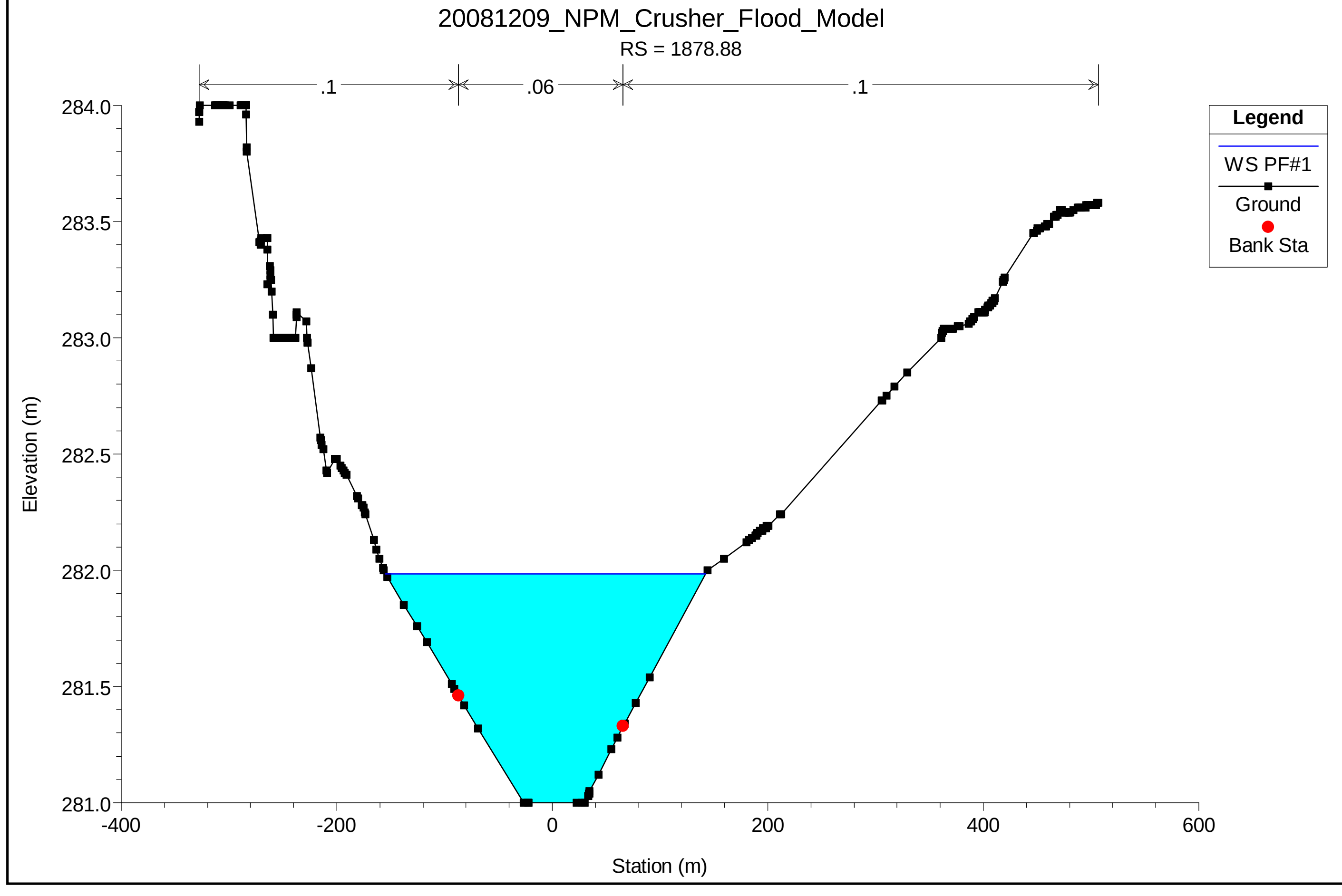
Cross-Section	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude Number
	(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
2387.36	19.5	282	282.4	282.17	282.41	0.00278	0.42	47.12	149.92	0.23
2117.85	47.5	281.25	282.13		282.13	0.000763	0.34	154.68	346.08	0.14
1878.88	47.5	281	281.99		281.99	0.000486	0.33	173.59	297.37	0.11
1677.64	49	280.96	281.9		281.91	0.000349	0.29	197.17	300.01	0.1
1617.67	49	280.7	281.89		281.89	0.000199	0.26	312.89	396.27	0.08
1531.38	49	280	281.88		281.88	0.000099	0.23	300.85	296.76	0.06
1418.94	49	281	281.55	281.55	281.81	0.045022	2.28	21.5	41.4	1.01
1379.31	49	280	280.78	280.29	280.8	0.001511	0.54	97.49	143.55	0.2
1277.95	49	280	280.59	280.23	280.61	0.002387	0.56	99.22	186.66	0.24
1111.46	50	279	280.5	279.6	280.5	0.000373	0.34	175.11	205.04	0.1
1084	50	278.96	280.35	279.72	280.44	0.004375	1.31	38.29	220.51	0.37
1076	Culvert									
1068.45*	50	278.96	279.98		280.15	0.013361	1.83	27.39	200.94	0.61
887.64	50	278.81	279.66		279.67	0.000918	0.39	150.96	291.5	0.15
661.44	53	278.63	279.35		279.36	0.002096	0.55	111.82	250.8	0.22
350.36	53	277.81	278.6		278.62	0.002822	0.68	104	225.13	0.26
115.08	56	277	278.05	277.59	278.07	0.002	0.59	104.6	199.96	0.22

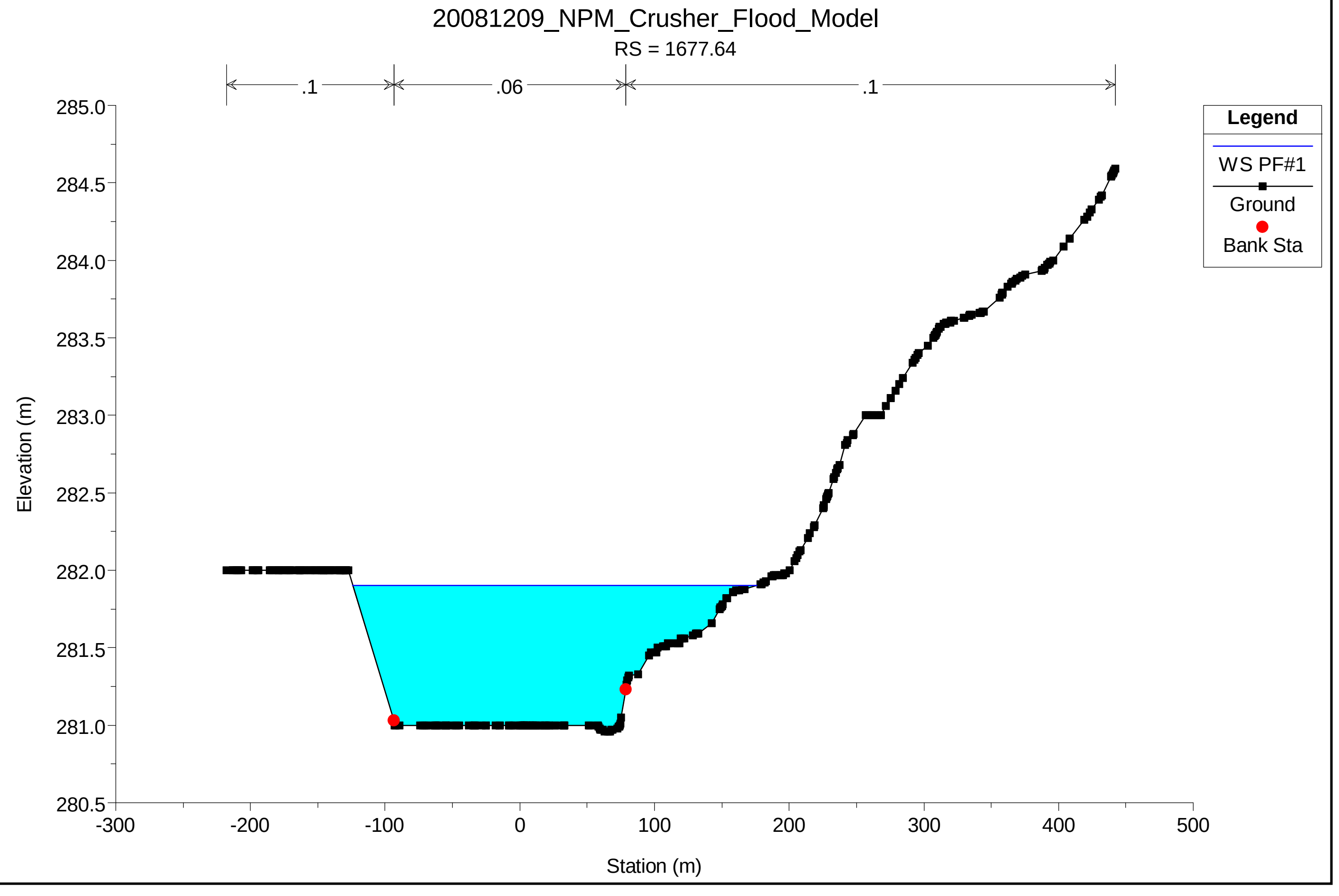
Culvert Data

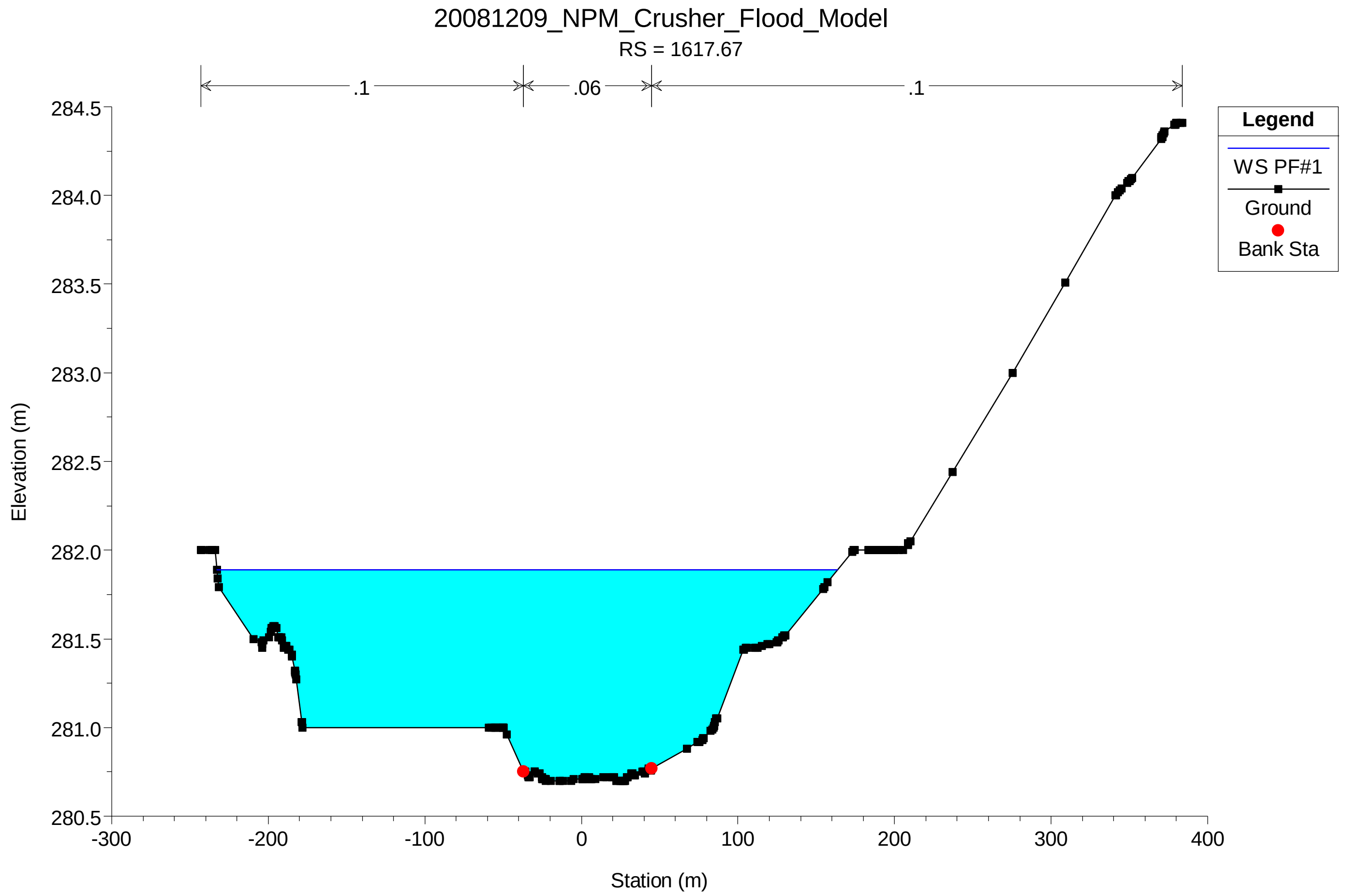
E.G. US.	W.S. US.	E.G. IC	E.G. OC	Min El Weir	Q Culv Gr	Q Weir	Delta WS	Culv Vel US	Culv Vel DS	
(m)	(m)	(m)	(m)	(m)	(m3/s)	(m3/s)	(m)	(m/s)	(m/s)	
280.44	280.35	280.25	280.44	281.5	50		0.37	1.77	1.9	

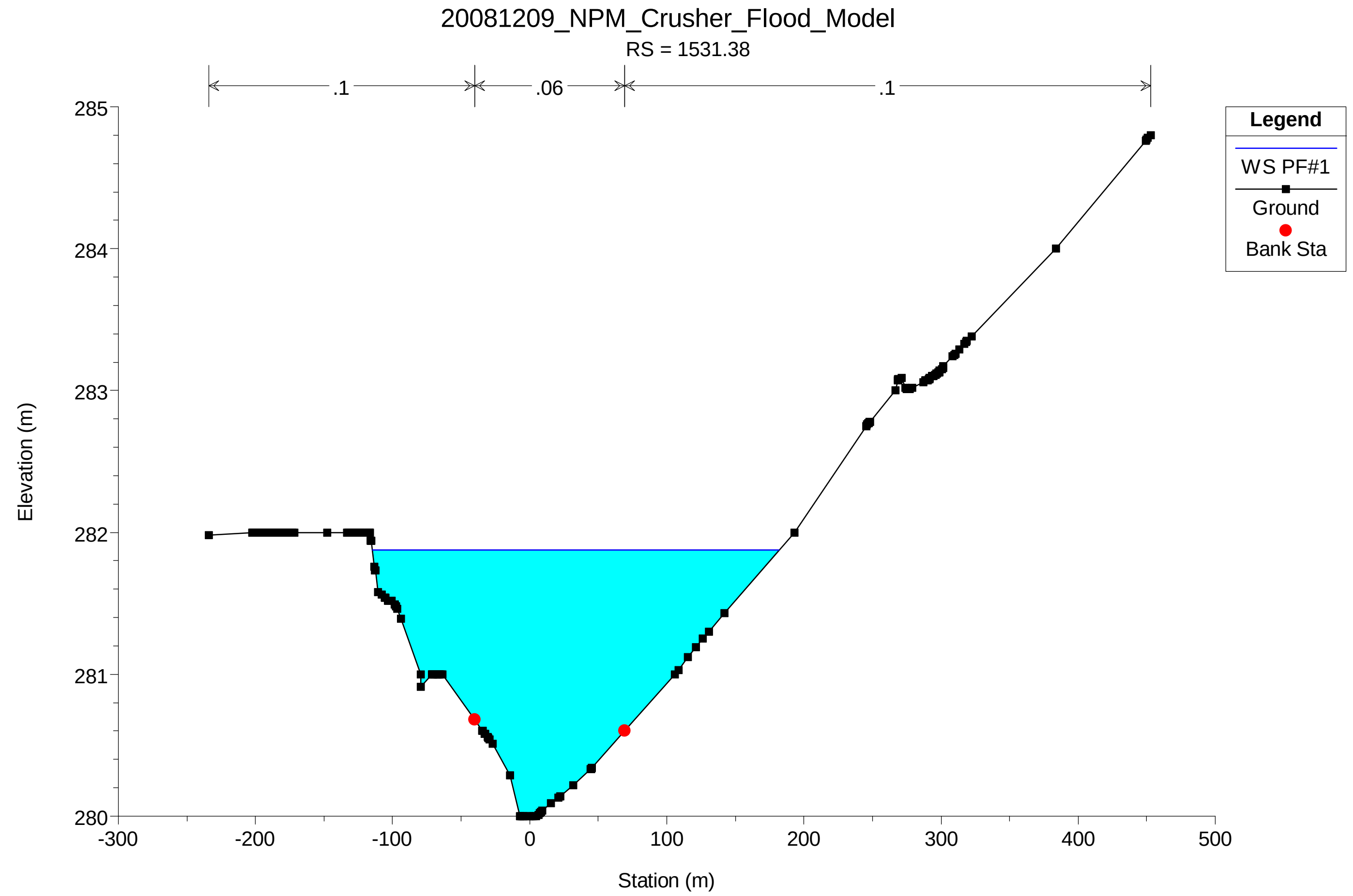

20081209_NPM_Crusher_Flood_Model
RS = 2387.36
.1
.06
.1
Legend
WS PF#1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
287
286
285
284
283
282
-300
-200
-100
0
100
200
300
400
500

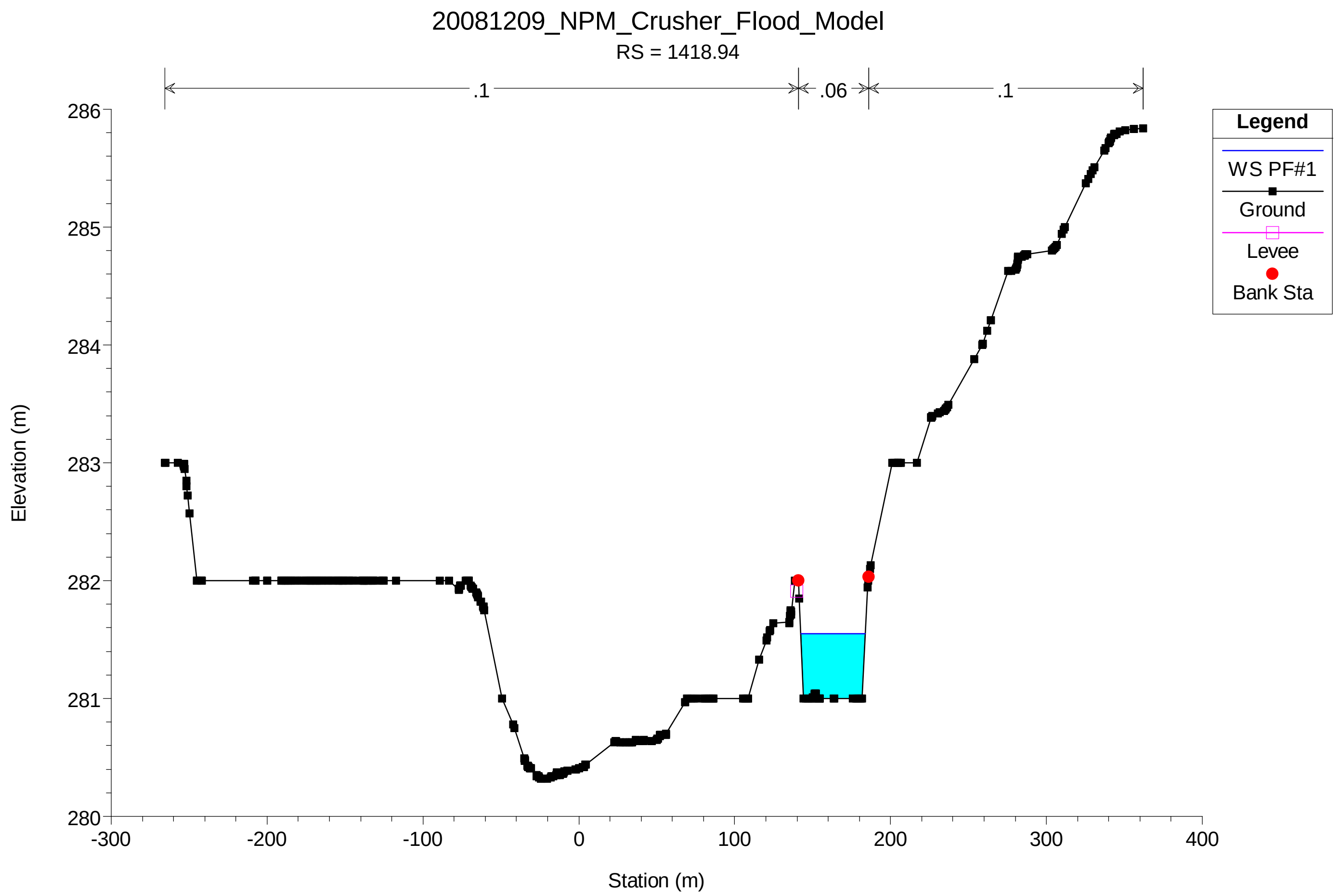

20081209_NPM_Crusher_Flood_Model
RS = 2117.85
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
Station (m)
285
284
283
282
281
-600
-400
-200
0
200
400
600

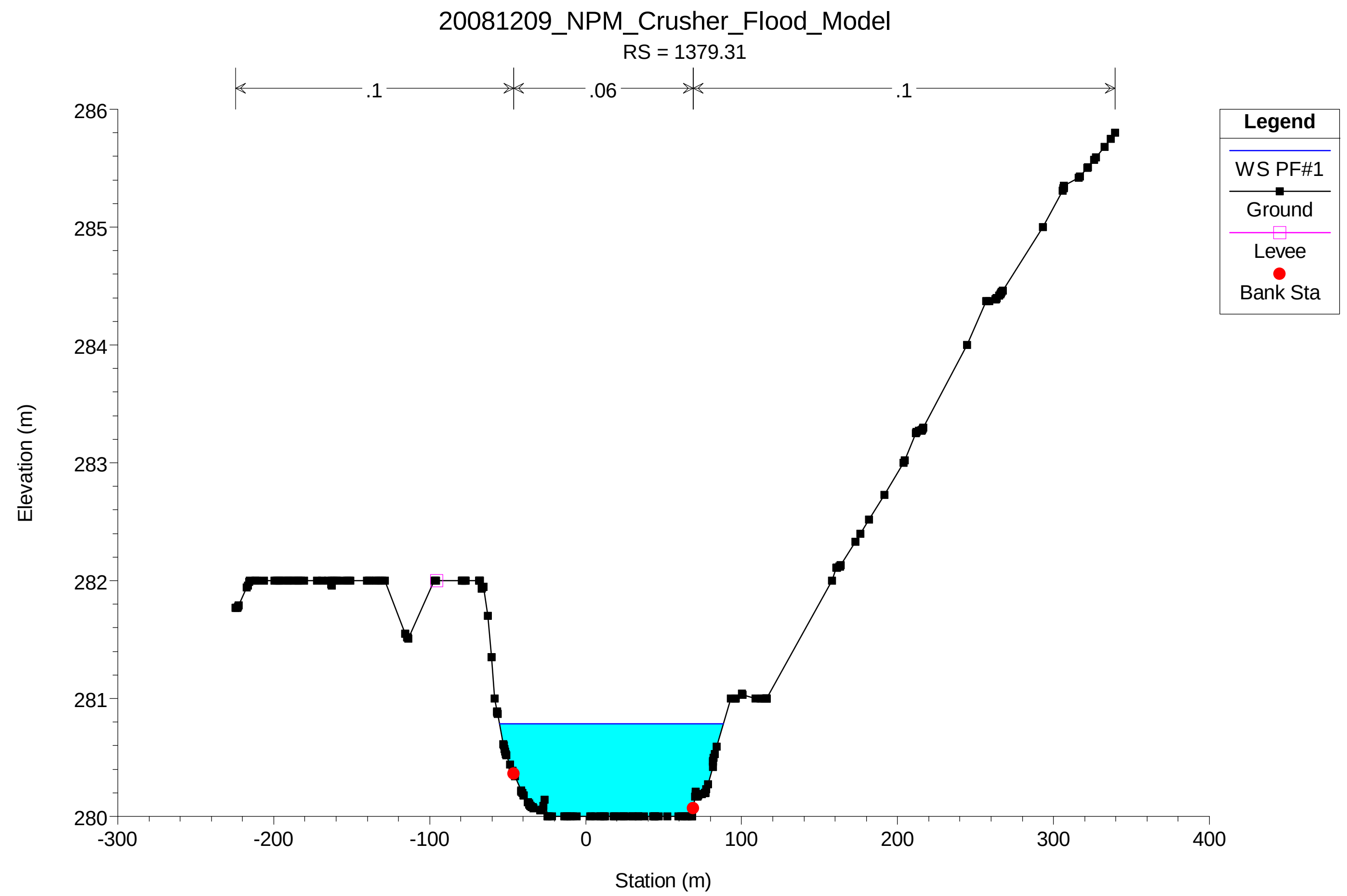

20081209_NPM_Crusher_Flood_Model
RS = 1878.88
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
Station (m)
284.0
283.5
283.0
282.5
282.0
281.5
281.0
-400
-200
0
200
400
600

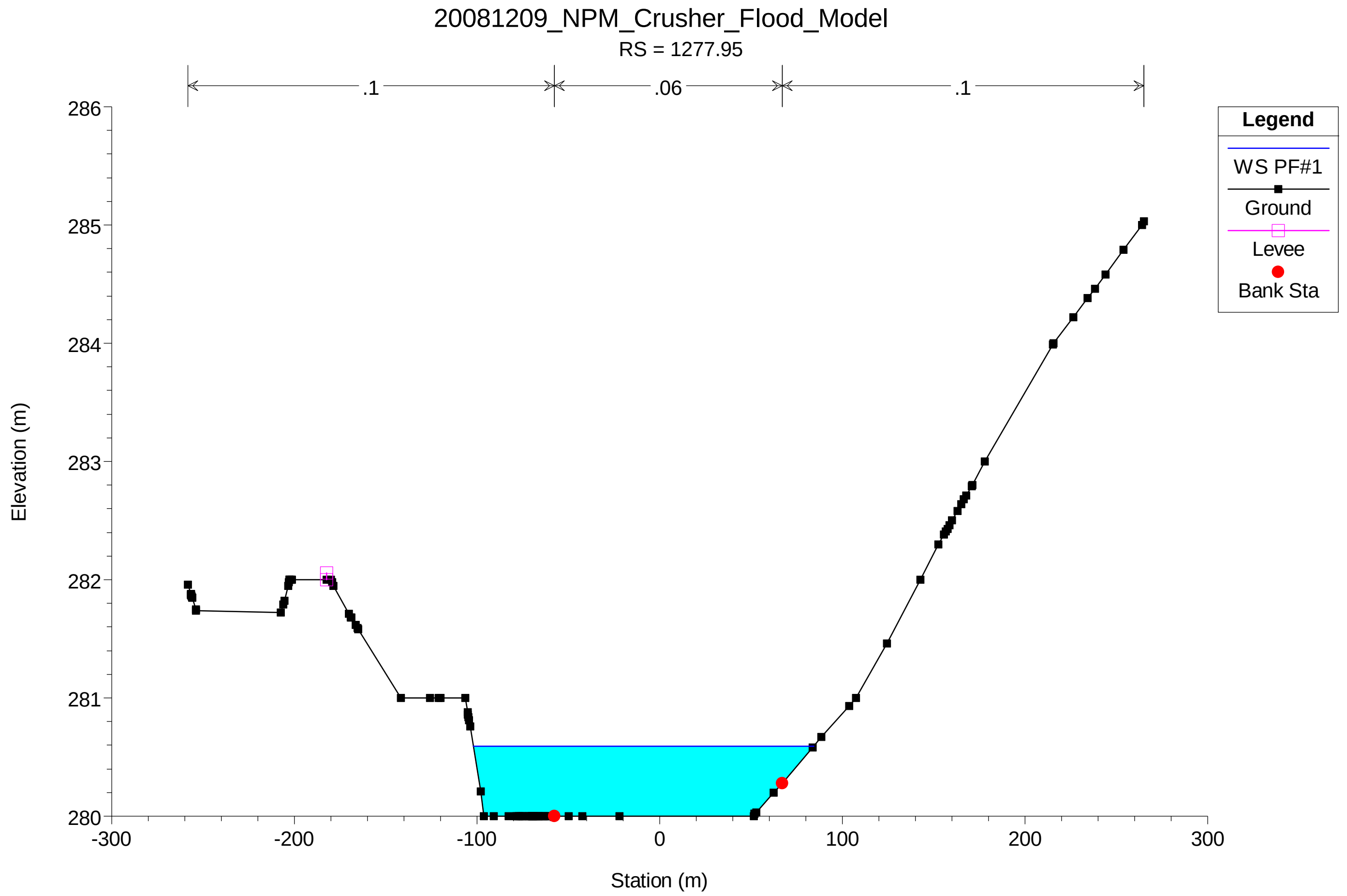

20081209_NPM_Crusher_Flood_Model
RS = 1677.64
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
Station (m)
285.0
284.5
284.0
283.5
283.0
282.5
282.0
281.5
281.0
280.5
-300
-200
-100
0
100
200
300
400
500

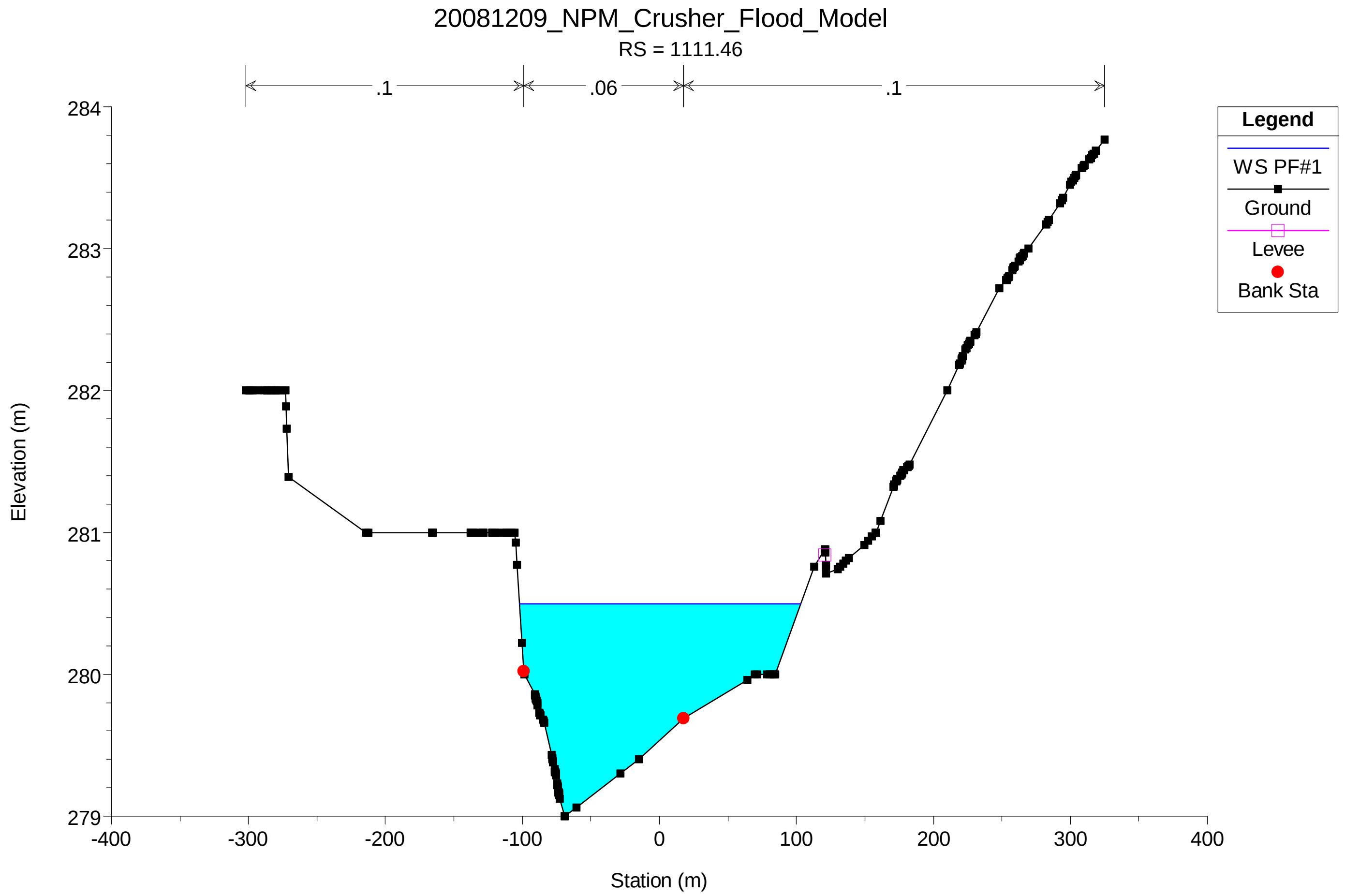

20081209_NPM_Crusher_Flood_Model
RS = 1617.67
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
Station (m)

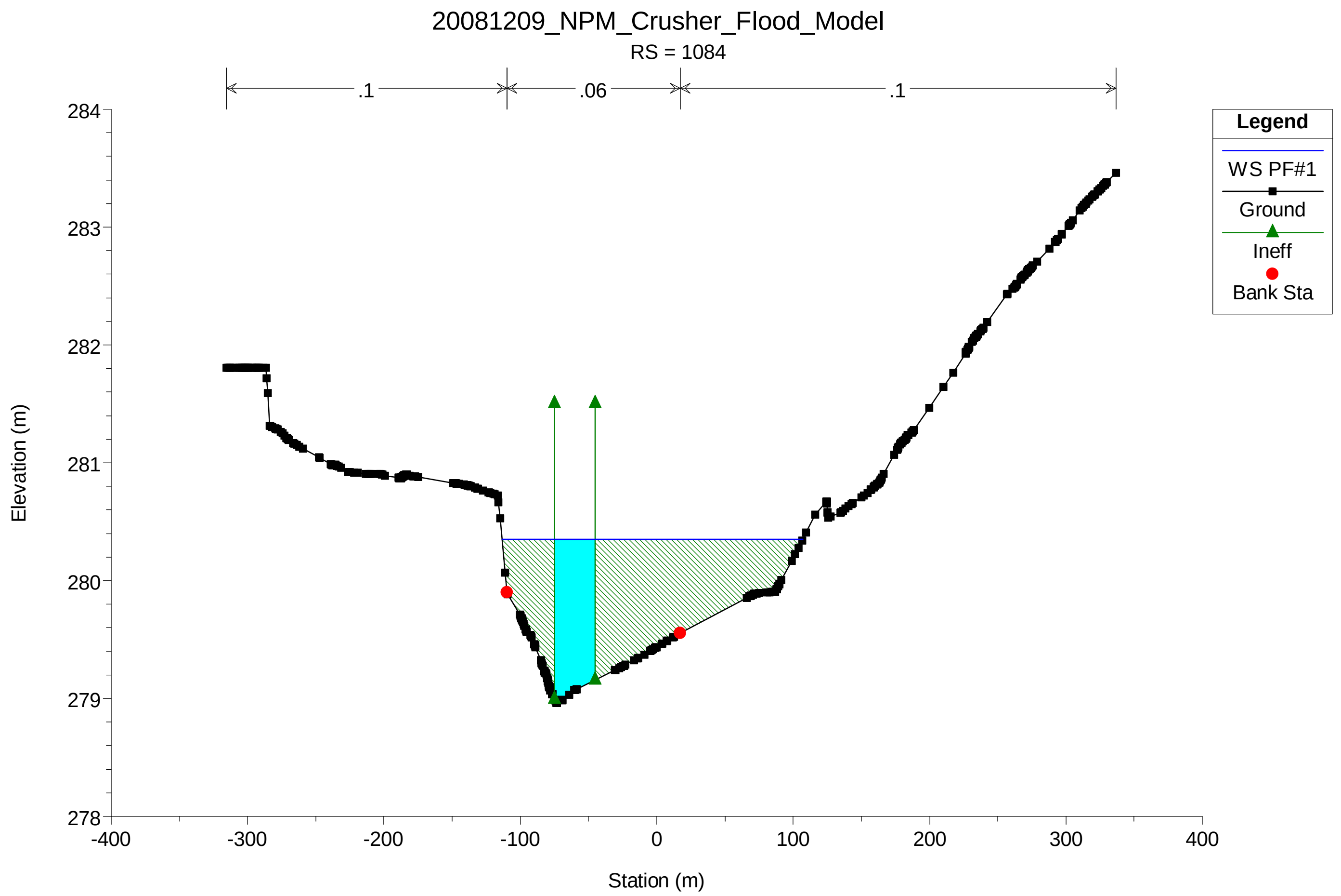

20081209_NPM_Crusher_Flood_Model
RS = 1531.38
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
Station (m)

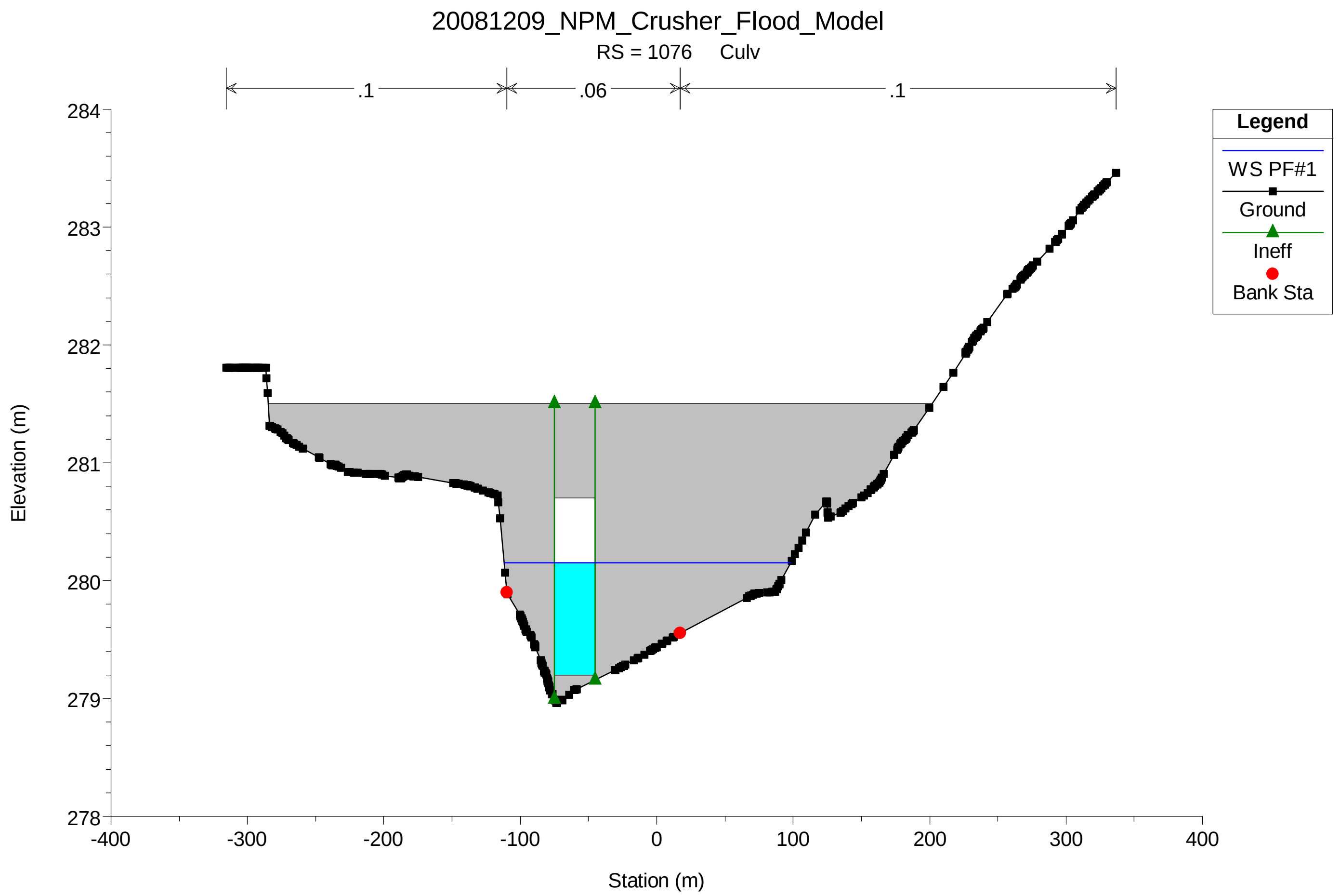

20081209_NPM_Crusher_Flood_Model
RS = 1418.94
.1
.06
.1
Legend
WS PF#1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

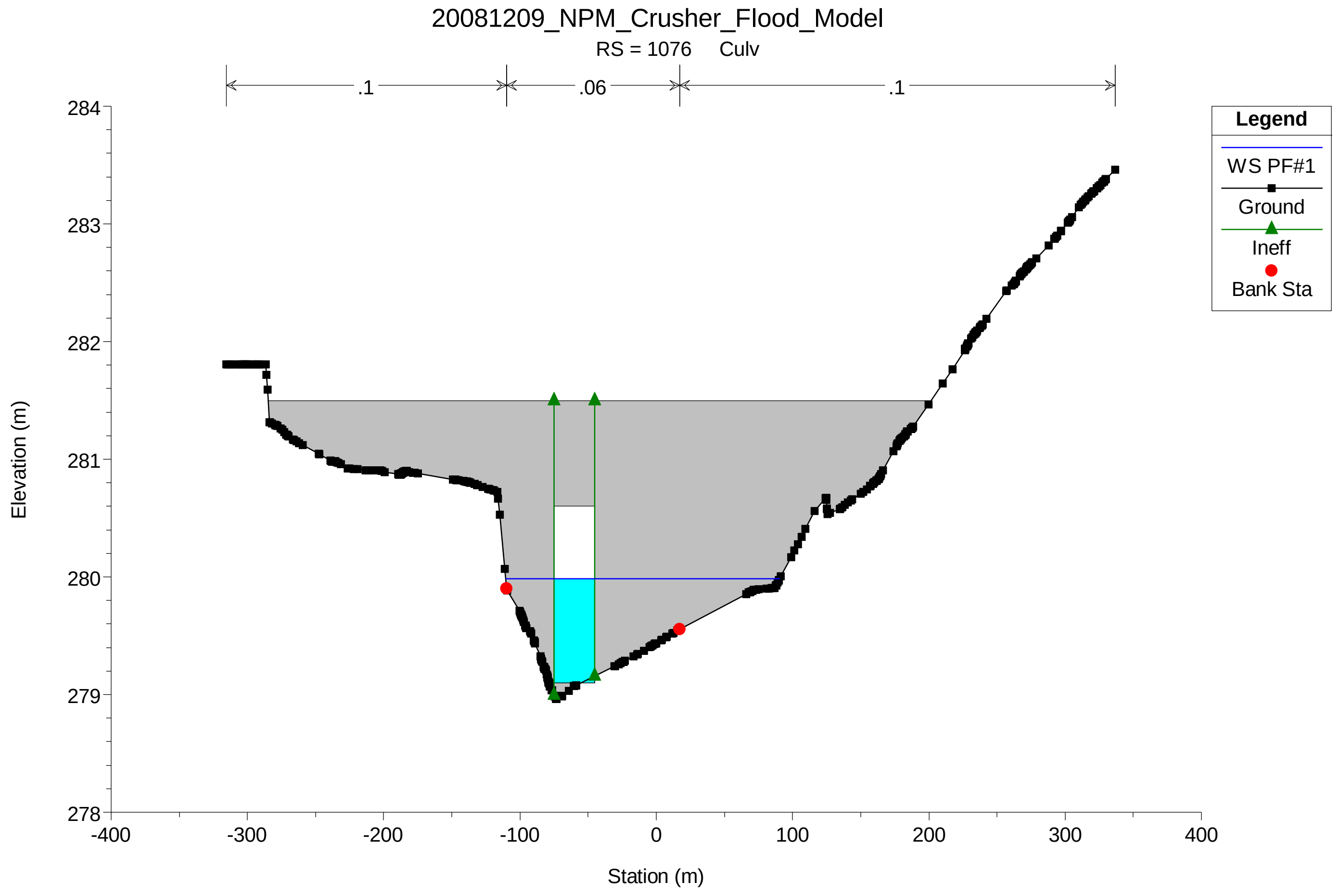

20081209_NPM_Crusher_Flood_Model
RS = 1379.31
.1
.06
.1
Legend
WS PF#1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


20081209_NPM_Crusher_Flood_Model
RS = 1277.95
.1
.06
.1
Legend
WS PF#1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

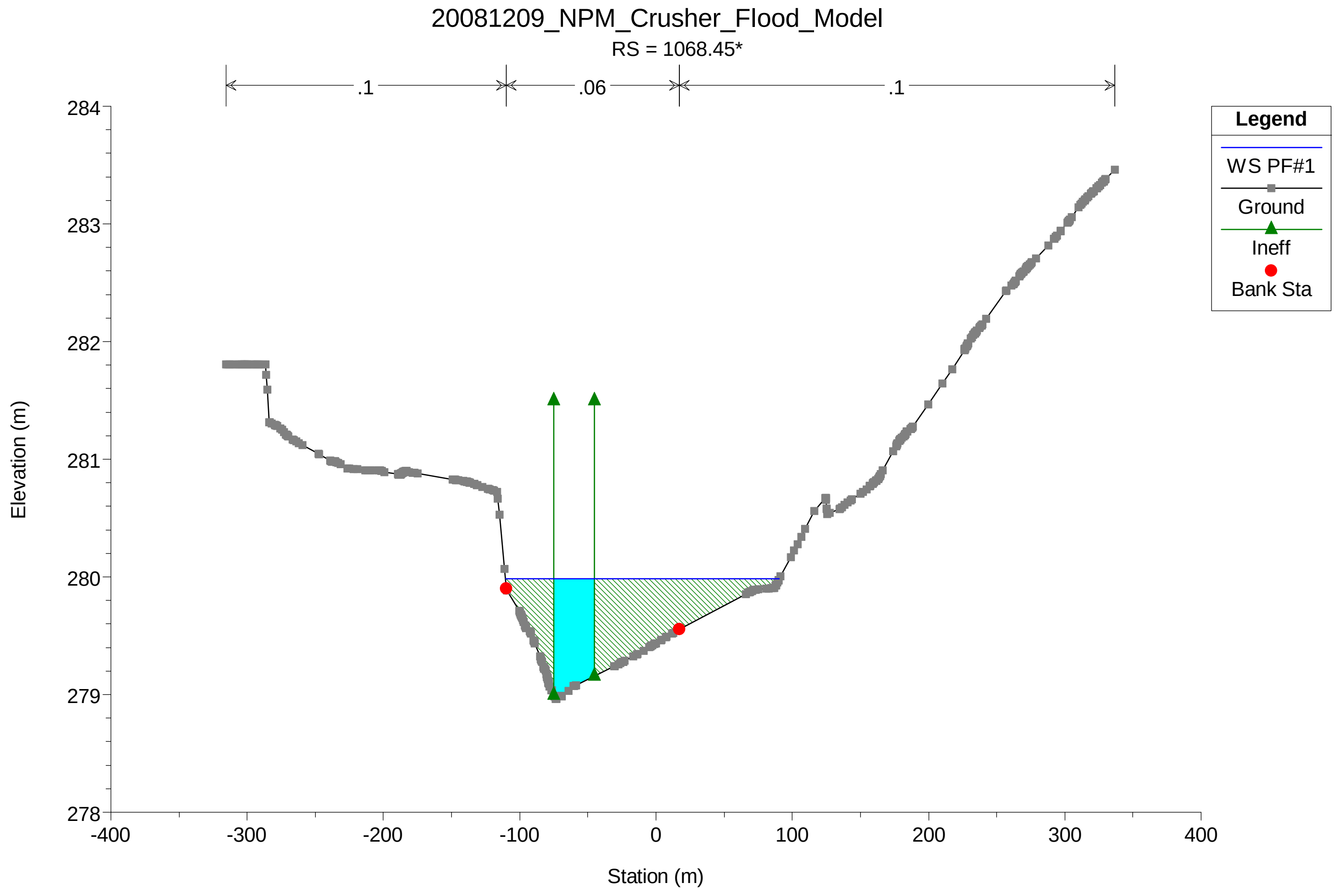

20081209_NPM_Crusher_Flood_Model
RS = 1111.46
.1
.06
.1
Legend
WS PF#1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


20081209_NPM_Crusher_Flood_Model
RS = 1084
.1
.06
.1
Legend
WS PF#1
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)

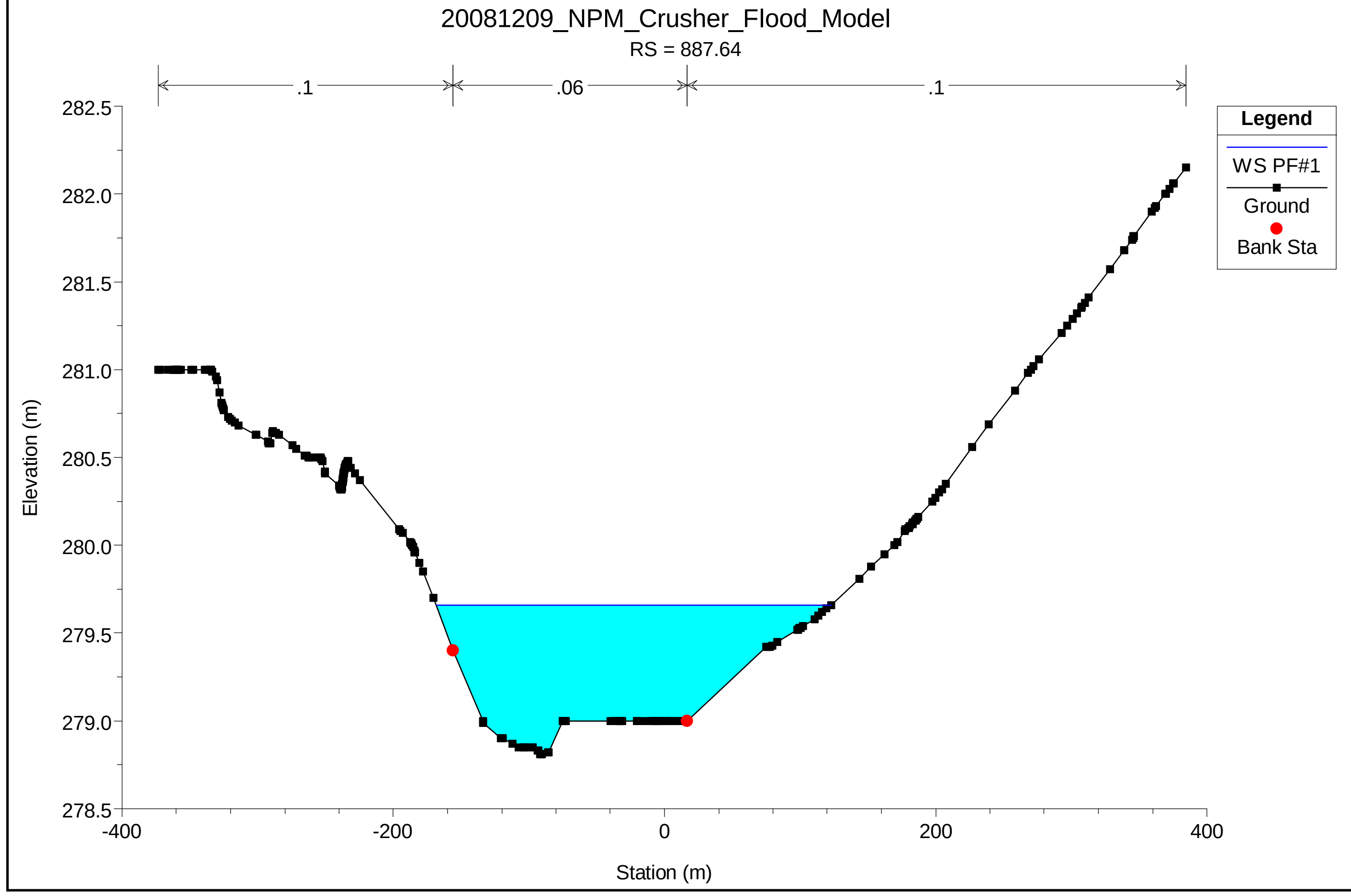

20081209_NPM_Crusher_Flood_Model
RS = 1076 Culv
.1
.06
.1
Legend
WS PF#1
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)



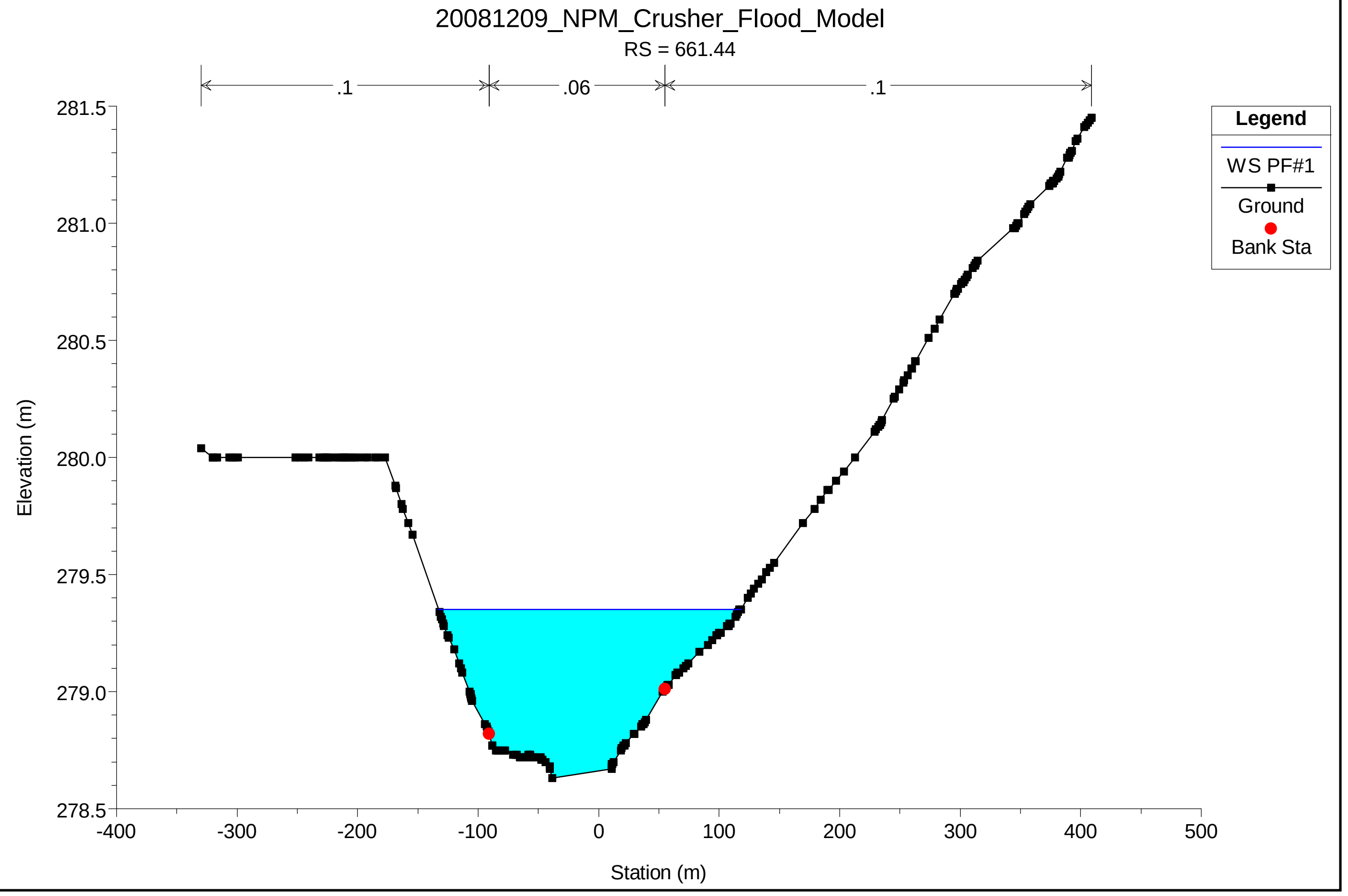
20081209_NPM_Crusher_Flood_Model
RS = 1076 Culv
.1
.06
.1
Legend
WS PF#1
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)



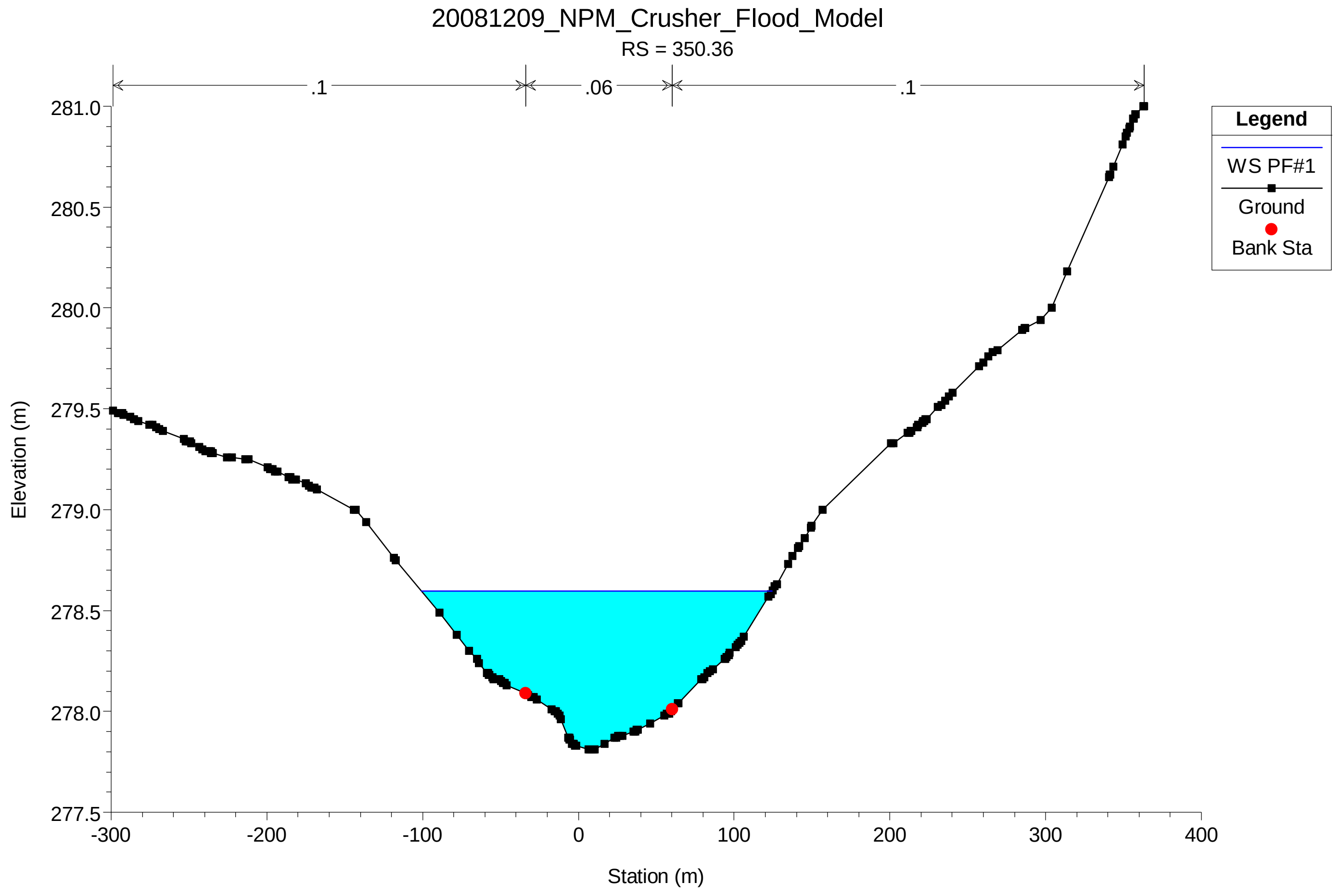
20081209_NPM_Crusher_Flood_Model
RS = 1068.45*
.1
.06
.1
Legend
WS PF#1
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)



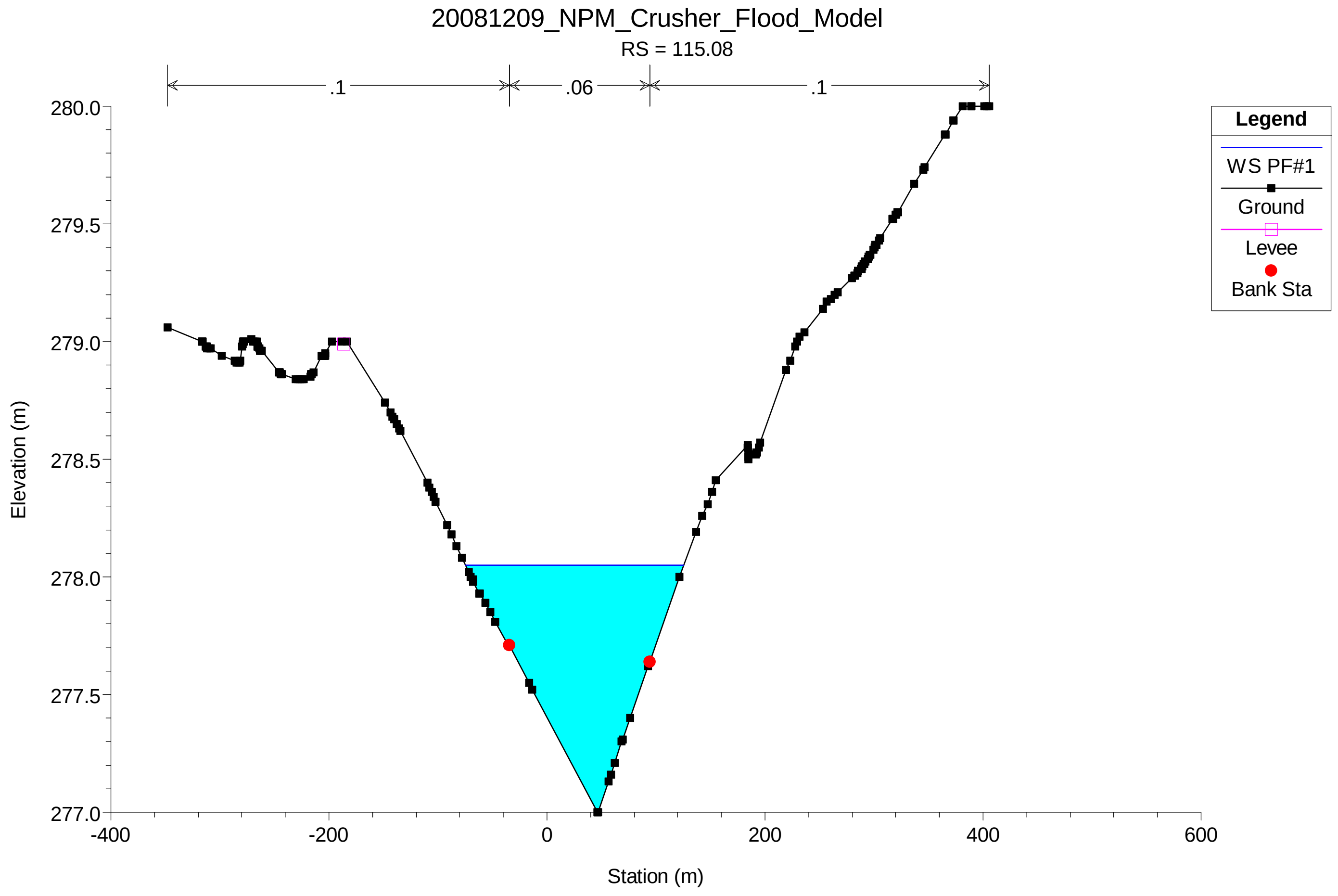
20081209_NPM_Crusher_Flood_Model
RS = 887.64
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
Station (m)



20081209_NPM_Crusher_Flood_Model
RS = 661.44
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
Station (m)



20081209_NPM_Crusher_Flood_Model
RS = 350.36
.1
.06
.1
Legend
WS PF#1
Ground
Bank Sta
Elevation (m)
281.0
280.5
280.0
279.5
279.0
278.5
278.0
277.5
-300
-200
-100
0
100
200
300
400
Station (m)



20081209_NPM_Crusher_Flood_Model
RS = 115.08
.1
.06
.1
Legend
WS PF#1
Ground
Levee
Bank Sta
Elevation (m)
280.0
279.5
279.0
278.5
278.0
277.5
277.0
-400
-200
0
200
400
600
Station (m)

GHD

10 Bond Street Sydney NSW 2000

-

T: 2 9239 7100 F: 2 9239 7199 E: sydmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft	R Towner	R Berg	Jflo	R Berg		22/12/08

Appendix G

Groundwater Assessment

Evaluation of Regolith Permeability in the Estcourt and Rosedale TSF Areas

19 December 2008

Mr Daniel Mees
GHD Pty Ltd
72 McNamara Street
ORANGE NSW 2800

Our ref: 21/17903

Dear Daniel

Northparkes Mine
Evaluation of Regolith Permeability in the Estcourt and Rosedale TSF Areas

The area to the north of open cut pit E27 is proposed to be used as a tailings storage facility (TSF) for thickened tailings as shown in the site plans contained in Attachment A1. It is referred to as the Estcourt TSF and it is proposed to have a final height of approximately 28 m above surface level. The approved Rosedale TSF is located to the east of the ore processing plant. This letter report summaries the results of hydrogeological and geotechnical investigations conducted in these areas to characterise the hydrogeology and permeability of the strata, which would form the base of the TSFs and underlies the site at depth.

1 Hydrogeological Investigations

The PB (2003) report "In-Pit Tailings Disposal, Hydrogeology Investigation and Groundwater Impact Assessment" has been reviewed and the data relevant to the Estcourt and Rosdelae TSF sites summarised below. The PB report was prepared to support the Statement of Environmental Effects submitted as part of the development application to Parkes Shire Council (PSC) for in-pit tailings storage utilising open cut pit E27. The development was subsequently approved by PSC.

1.1 Site Geology

The geology of the mine area is characterised, as regolith-overlying bedrock comprised of volcanics and mafic intrusives, which forms the host rock to the mineralisation. The regolith is described as consisting of several layers, with a thin surface layer of soil underlain by red-brown or grey to white clays. The red-brown clay is described as moderately plastic and a relatively homogenous clay unit. It ranges in thickness from 2 to 21 m across the larger E27 study area, which includes the Estcourt site to the north of the E27 pit. The grey clay, described as platy in texture, may be gradational to the overlying red-brown clay. It is believed to be predominately kaolinite and can be mottled in appearance. Saprolite is found underlying the clay and is comprised of highly weathered host rock and has a relic texture visible.

PB (2003) note the total thickness of the regolith ranges between 10 to 40 m and on a regional scale, the thickness of the regolith increases in a northwards direction obtaining a maximum thickness in the valley area of the Wombin State Forest to the north of the mine site.

Underlying the regolith, PB (2003) identified and modelled 4 rock types in the host rock characterised by the degree of weathering and mineralisation. Away from the E27 orebody and mineralised zone, an upper oxidised zone of host rock (also referred to as saprock) was encountered at depths from 21 to 48 m. The oxidised zone is described as less weathered than the overlying saprolite and ranges in thickness from 7 to 45 m across the mine site and is the principle zone exploited for water supply in the area. Fresh host rock is found underlying the oxidised zone.

1.2 Permeability Testing

The open cut pit E27 investigations included measurements of hydraulic conductivity of the saturated and unsaturated regolith. Two bores from the open cut pit E27 investigations are located in the Estcourt TSF area as shown in the attached plan A2. Bore MB8 is located on the eastern side of the proposed Estcourt TSF adjacent to the existing TSF 1 and MB10 immediately to the north of the proposed TSF. In the Rosedale TSF area, bore 15 is located in the northwest corner and bore MB14 to the west. Testing of the saturated regolith materials in these bores included laboratory permeability analysis of undisturbed samples and core by GHD-Longmac. The undisturbed push tubes and core samples were subjected to laboratory falling head and triaxial tests to determine the permeability. The formation shown on the borehole logs are also listed in Table 1 and the results indicate the clay and underlying saprolite in the Estcourt TSF area to have a very low permeability in the order of 1E-10 to 2E-11 m/s. The results in the Rosedale TSF area are also very low at less than 2.5 E-11 m/s.

The results from the open cut pit E27 investigations also in Table 1, indicate the very low permeability results for the clays and saprolite are consistent across the larger study area surrounding the E27 and E22 open cut pits.

Table 1 Results of Permeability Testing in the Regolith

Bore	Test Type	Depth tested	Formation	K (m/d)	K (m/s)
Estcourt	*Area*				
MB08	Falling Head	4 – 4.4	Saprolite - grey silty clay	8.64 E-6	1.00 E-10
MB10	Falling Head	2.5 - 2.9	Clay - medium brown	1.73 E-6	2.00 E-11
MB10	Falling Head	7 – 7.3	Clay - grey in-situ weathered rock ?	3.2 E-6	3.7 E-11
Rosedale	*Area*				
MB14	Triaxial	5.5 – 5.9	Saprolite - grey white clay	2.94 E-7	3.4 E-12
MB15	Triaxial	2 – 2.3	Red brown clay	2.16 E-6	2.5 E-11
MB15	Triaxial	7 – 7.4	Saprolite – grey clay	2.68 E-7	3.1 E-12
E27 Pit	*Area*				
MB11	Falling Head	4 – 4.3	Grey – white clay	1.73 E-5	2.0 E-10
MB12	Falling Head	4.5 – 4.8	Medium brown clay	8.64 E-6	1.0 E-10
MB13	Triaxial	4.5 – 4.8	Red – brown clay	6.65 E-5	7.7 E-10

Permeability testing results of the oxidised zone and fresh host rock from the Estcourt and Rosedale TSF areas are summarised in Table 2 and Table 3 respectively. The results indicate a low permeability ranging over several orders of magnitude from 5.1E-6 m/s to 2.7E-8 m/s for the Estcourt TSF area and 1.8 E-7 to 2.4E-8 m/s for the Rosedale TSF area. The borehole logs MB14 and MB15 indicate the saprolite extends to around 28 m depth the west and north west of the Rosedale TSF.

Table 2 Results of Permeability Testing in the Host Rock Estcourt TSF Area

Bore	Test Type	Depth tested	Formation	K (m/s)
MB08	Triaxial	37.4-37.5	Oxidised – Weathered Intrusive	2.7 E-8
MB08	Triaxial	47.1 – 47.2	Oxidised – Weathered Intrusive	2.8 E-8
MB8A	Packer test	29 - 32	Oxidised - Deeply Weathered	1.66 E-7
MB8A	Packer test	44.6 - 45.6	Oxidised -Deeply Weathered	1.4 E-7
MB8A	Packer test	53.6 –56.6	Fresh Host Rock	9.0 E-8
MB8A	Pump test*	36.2 – 59.6	Oxidised and Fresh Host Rock	9.1E-8
MB10	Packer test	34.8 – 37.8	Oxidised - Slightly Weathered	5.6 E-8
MB10	Pump test	25.5 –44.6	Oxidised and Fresh Host Rock	5.1 E-6

* based on geometric mean of 5 pump test data

Table 3 Results of Permeability Testing in the Host Rock Rosedale TSF Area

Bore	Test Type	Depth tested	Formation	K (m/s)
MB14	Packer test	29.4 – 32.4	Slightly Weatheres	1.8 E-7
MB14	Packer test	38.15 – 41.14	Slighly Weathered to fresh	8.5 E-8
MB14	Pump test*	23 – 50.6	Andesite - Fresh	2.4 E-8

* based on geometric mean of 4 pump test data

Numerous other permeability tests were completed in the oxidised and fresh host rock over the larger E27 open cut pit area and the results reported in Appendix I of the PB (2003) report. The results ranged from 1.8 E-7 m/s to 2.8 E-11 m/s with a geometric mean of 1.2 E-8 m/s and 1.3 E-08 m/s for the oxidised and fresh host rock respectively. The host rock permeability is several orders of magnitude greater than the overlying regolith.

1.3 Groundwater Modelling Results

PB (2003) constructed a 3 layer numerical model for the site and simulated flow paths assuming a in pit E27 TSF with tailings to 26 m above the natural surface level. The pre-mining groundwater flow direction in the oxidised zone is shown as from south to north across the region with a hydraulic gradient of approximately 0.0035. The modelling assumed a horizontal and vertical hydraulic conductivity for an upper tailings layer to be 2.6E-9 m/s and 8.5 E-10 m/s respectively based on test work and review of results reported in the literature. The upper model layer representing the regolith was assigned as inactive based on the very low permeability results which indicate it takes no significant part in groundwater flow at the mine site. Layer 2 represented the relatively more permeable oxidised zone and Layer 3 the underlying fresh host rock.

The PB (2003) groundwater modelling results show travel times of an inert solute in the oxidised zone of the host rock to be extremely slow at approximately 1,000 years per kilometre. They predicted it would take about 5,000 years to reach the nearest bore which is located about 4 km from the E27 open cut pit. Results of the geochemical assessment indicate that the mobility of the potential metal contaminants from the tailings would be low due to the buffering capacity in the aquifer system. PB (2003) concluded that the very long travel times would allow ample time for attenuation processes to occur and predicted negligible impacts to the groundwater regime or to the nearest potential receptor (a licenced and unused groundwater bore) were likely to occur from the permanent use of the E27 open cut pit as a TSF.

PB (2003) also concluded that movement of tailings water down to the top of the more permeable oxidised zone is expected to be negligible due to the much lower permeabilities in the regolith.

2 Geotechnical Reports

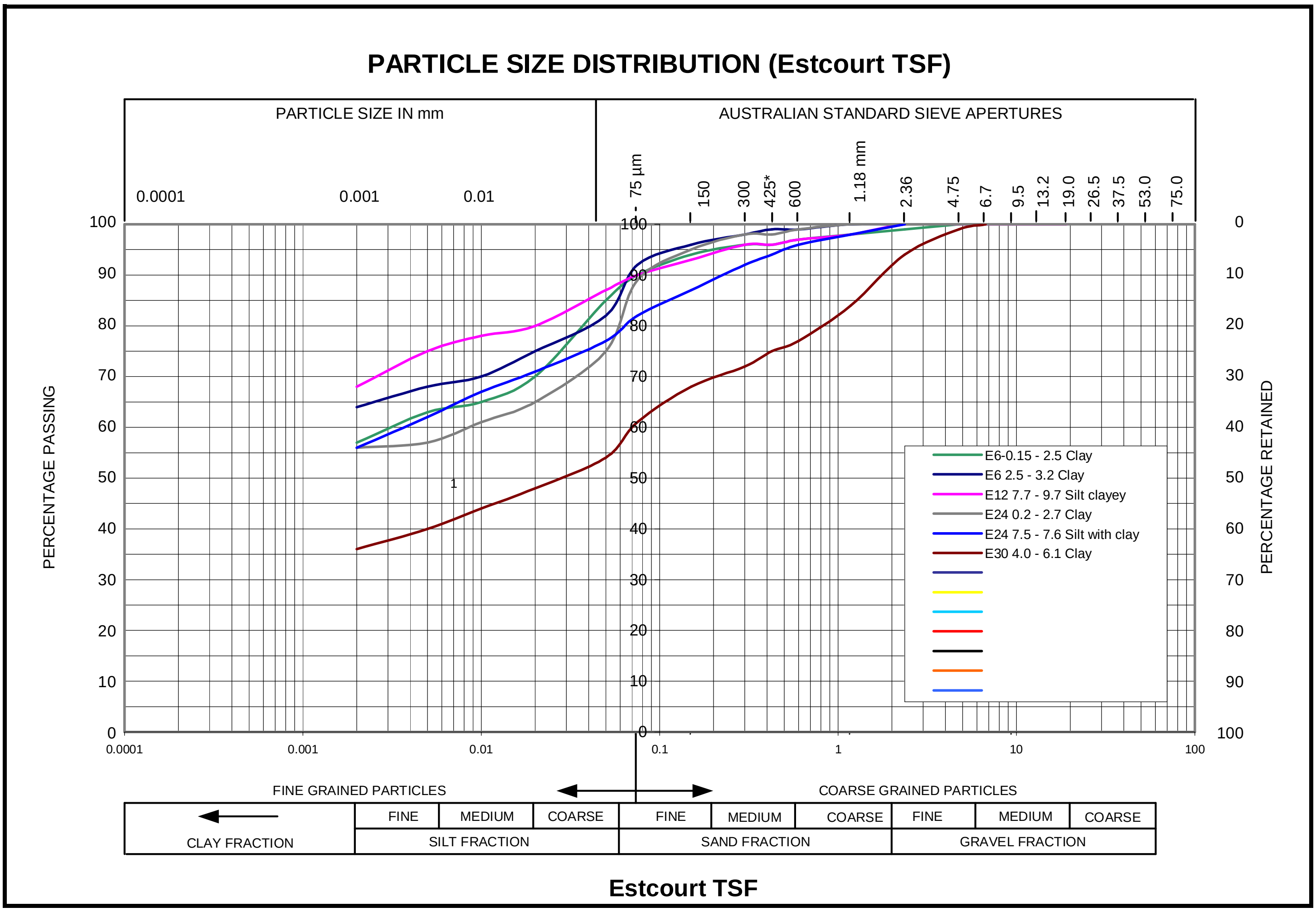
Geotechnical investigations by Knight Piesold have been conducted in the Estcourt TSF area to source material for approved construction works. Bore locations (Plan A3) show two series of around 20 bore holes have been drilled to less than 10 m depth across the Estcourt TSF area to characterise the shallow lithology and for the determination of the geotechnical properties of these layers. The bore hole logs in the Estcourt TSF area confirm the lithology, as described by PB (2003) is consistent across the site and generally show between 2 to 9m of stiff to very stiff clay overlying a silt which is described as silt clayey or a silt with clay and sometimes with sand and trace fine gravels. This layer is interpreted to be in-situ residual deposit similar to the weathered saprolite as described by PB (2003).

Soil testing at the Estcourt TSF site included six particle size distribution tests completed by Australian Soil testing in 2006 from samples ranging in depths from 0.5 to 9.7 m. The results, shown below, indicate the majority of the samples are comprised of between 55 to 65% clay with around 10% to 15 % of the sample lying within the sand and gravel fraction. One sample from borehole E30 at 4 to 6.1 m depth described as a clay silty with sand shows a higher proportion of the sand and gravel fractions up to 40% at this locality. The deepest sample from bore E12 at 7.7m to 9.7 m depth was described as silt and had the highest proportion of clay at 68%.

A further 28 tests from 0.5 to 6 m depth where completed with analysis of the sand and gravel fraction only showing in 25 of the samples between 90% and 95% of the sample was comprised of clay and silt less than 0.075 mm. No permeability analysis for the geotechnical borehole samples was available.

Geotechnical Investigations have also been completed by Knight Piesold in the Rosedale TSF area and a location of their investigations bore holes is shown in Appendix A4. The bore hole logs in the Rosedale TSF area again confirm the lithology of an upper very stiff clay, as described by PB (2003) is consistent across the site generally between 2 to 10 m thick overlying a silt which is described as silt clayey or a silt with clay and sometimes with sand and trace fine gravels and is generally interpreted to be a residual deposit. The thickness of the clay does appear to thin to the south and is 3.6 m thick on the south western corner, thinning to between 0.5 and 1.5 m thickness in the centre of the southern boundary and then increasing again to 1.2 to 2 m thickness to the east. The 2008 Knight Piesold bore logs indicates the clay is consistently found across the approved Rosadale TSF area.

Figure 1 Estcourt TSF area particle size grading results



3 Estcourt and Rosedale TSFs Potential Impacts

Previous permeability testing in, and adjacent to, the proposed Estcourt TSF indicates that the regolith comprised of clays and saprolite has a very low permeability equal to or below 1 E-10 m/s. These results are consistent with test results across the larger E27 open cut pit site. The bore logs for MB8 and MB10 show the regolith material to be 32 to 36 m thick respectively. The Knight Piesold bore hole logs also indicate the low permeability clay layer and underlying silt/saprolite is predominately comprised of clay are continuous across the Estcourt TSF site.

The site location plan A1 shows an area to the north of proposed Estcourt TSF where the shallow material has been excavated for construction material at the mine. The depth of the borrow pit is understood to be less than 10 m. Based on the bore logs for MB8 and MB10 which are located either side of the borrow pit, a further 20 m of low permeability clay and saprolite would be expected to underlie the base of the borrow pit and separate low permeability tailings in the proposed TSF from the relatively more permeable oxidised host rock.

The permeability testing adjacent to the approved Rosedale TSF site also indicated very low permebility in the upper clay and underlying saprolite at two locations to the northwest and west of the Rosedale TSF site. The Knight Piesold bore hole logs also indicate the low permeability clay layer appears to be continuous across the site overlying the silt/saprolite.

As the groundwater flow direction typically reflects the surface topography, the development of open pits, subsidence zones and TSFs would be expected to modify the northerly pre-mining groundwater flow direction. Localised sinks (areas of lower groundwater levels) would be expected around any remaining open pits and subsidence zone and mounds of higher groundwater levels would be expected to be associated with the elevated TSFs.

Based on the PB (2003) testing and modelling results the potential impacts of seepage from the Estcourt TSF and Rosedale TSF would be expected to be similarly negligible due to:

» The presence of very low permeability clay and saprolite underlying the Estcourt and Rosedale TSFs separating the tailings from the underlying higher permeability aquifer associated with the oxidised zone;

» The lower permeability of the clay and saprolite would be likely to result in even slower travel times compared to the oxidised zone which were modelled by PB (2003) to be in the order of 1,000 years per kilometre; and

» The presence of the clay and very slow travel times has been predicted to result in the attenuation of potential metals contaminants during transport.

Yours sincerely

Genevieve Foley

Genevieve Foley
Senior Hydrogeologist
(03) 8687 8365

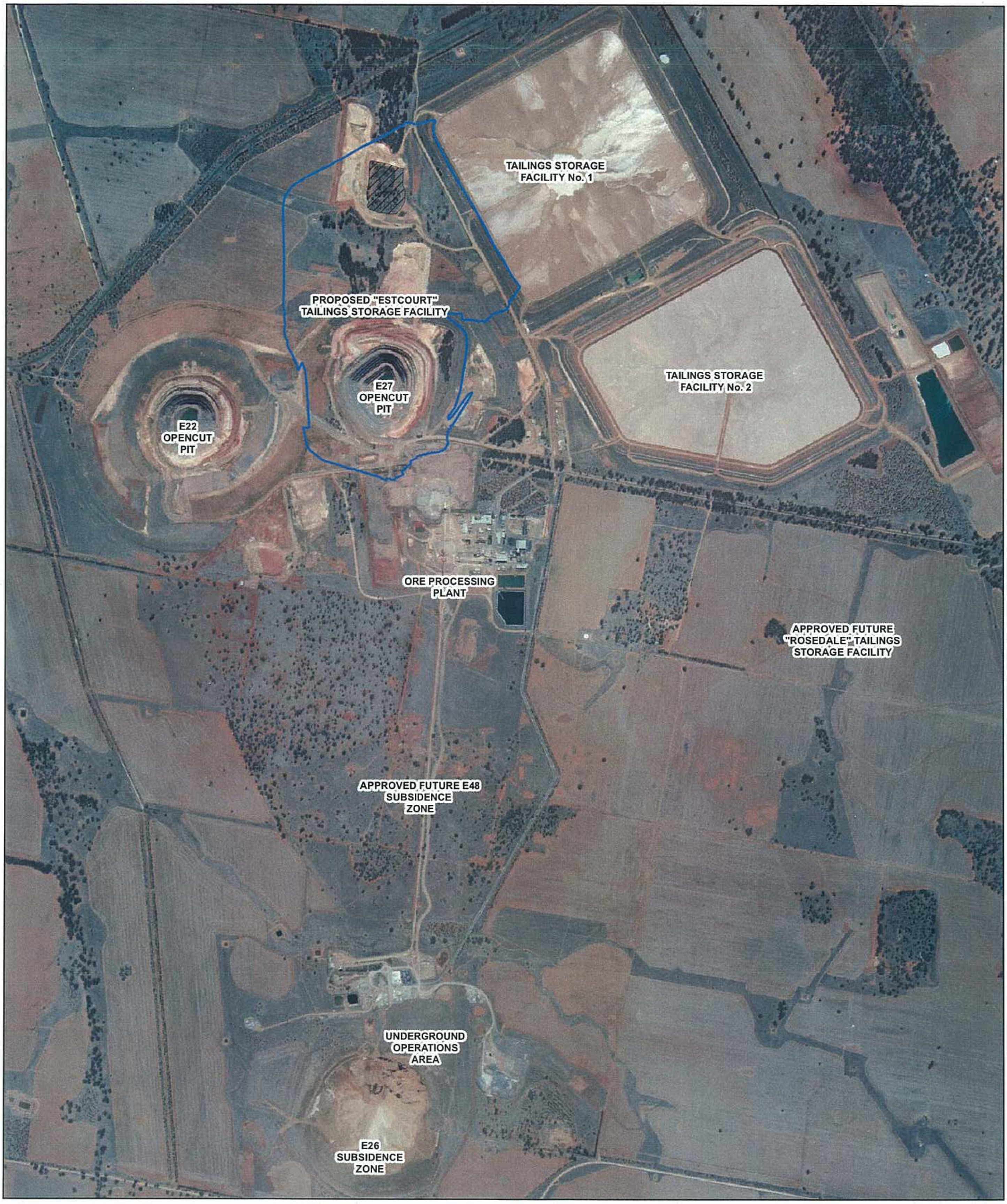
Attachments

A1 Estcourt Site Plan

A2 Investigation Bore Location Plan (PB 2003)

A3 Estcourt TSF Geotechnical Bore Location Plan (Piesold Knight)

A4 Rosedale TSF Geotechnical Bore Location Plan (Piesold Knight)



LEGEND

Disturbance Area

'Anna's Island', Approved vegetation clearing conducted September 2008.

1:18,000 (at A3)

0 75 150 300 450 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

CLIENTS | PEOPLE | PERFORMANCE

NorthParkes Mines
Section 75W Modification for NPM

Job Number	21-17903
Revision	A
Date	16 DEC 2008

Site Layout

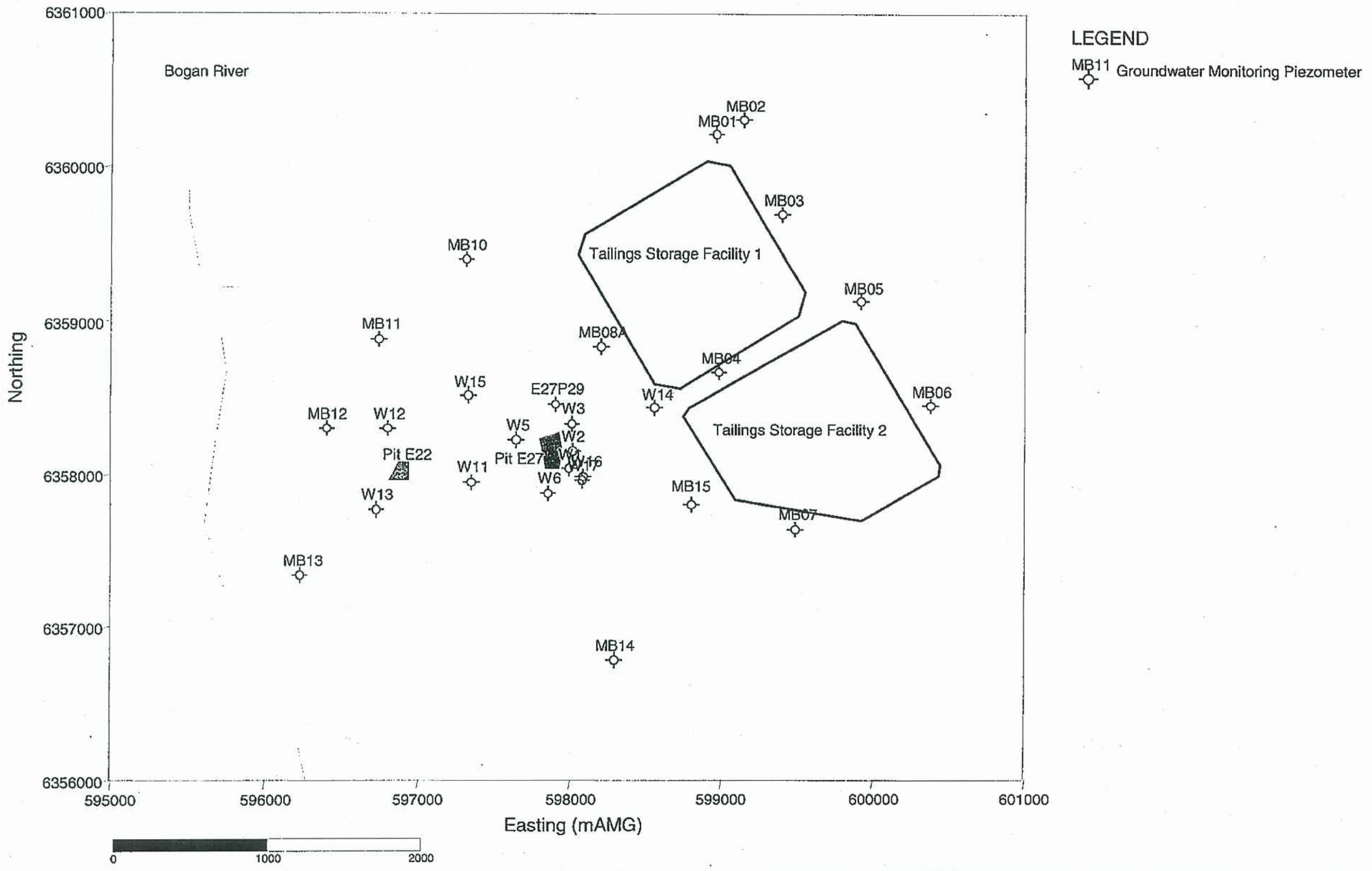
Figure 2

G:\21\17903\CADD\GIS\MapDocument\Z003_SiteLayout.mxd

10 Bond Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au

Data Sources: NSW Department of Lands: Topoweb2_wms - 2008; Navigate, Navteq: StreetMap - 2008; NorthParkes Mines: Aerial Photography - 18 July 2007. Created by: RCJOHNSON

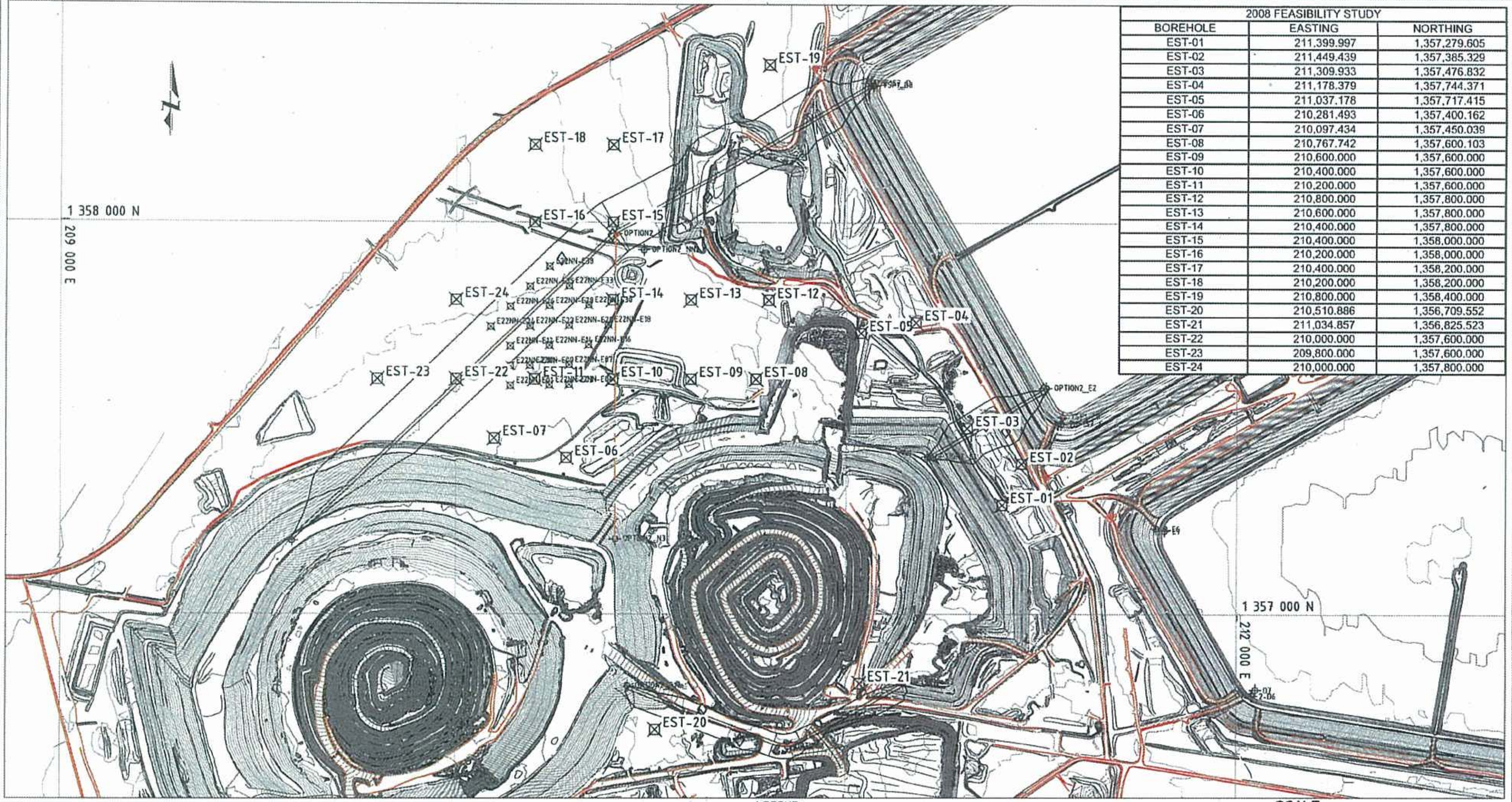
PARSONS BRINCKERHOFF



Client:	Northparkes Mines
Project:	Northparkes Mines In-Pit Tailings Disposal Hydrogeology Investigation
Title:	Groundwater Monitoring Piezometer Network

Figure 4.1

Job No: 2120123A



2008 FEASIBILITY STUDY		
BOREHOLE	EASTING	NORTHING
EST-01	211,399.997	1,357,279.605
EST-02	211,449.439	1,357,385.329
EST-03	211,309.933	1,357,476.832
EST-04	211,178.379	1,357,744.371
EST-05	211,037.178	1,357,717.415
EST-06	210,281.493	1,357,400.162
EST-07	210,097.434	1,357,450.039
EST-08	210,767.742	1,357,600.103
EST-09	210,600.000	1,357,600.000
EST-10	210,400.000	1,357,600.000
EST-11	210,200.000	1,357,600.000
EST-12	210,800.000	1,357,800.000
EST-13	210,600.000	1,357,800.000
EST-14	210,400.000	1,357,800.000
EST-15	210,400.000	1,358,000.000
EST-16	210,200.000	1,358,000.000
EST-17	210,400.000	1,358,200.000
EST-18	210,200.000	1,358,200.000
EST-19	210,800.000	1,358,400.000
EST-20	210,510.886	1,356,709.552
EST-21	211,034.857	1,356,825.523
EST-22	210,000.000	1,357,600.000
EST-23	209,800.000	1,357,600.000
EST-24	210,000.000	1,357,800.000

LEGEND:
E22NN-E03 BOREHOLE DRILLED 2005
EST-08 PROPOSED BOREHOLE 2008

SCALE
200 150 100 50 0 100 200 300 400
METRES

Knight Piésold CONSULTING

Knight Piésold Pty Ltd
A.B.N. 67 001 040 419
P O Box 1710, Hornsby, NSW 1635

DWG No. PE801-00008-004

REV	DESCRIPTION	BY.	CKD.	APP.	DATE.
A	ISSUED FOR INFORMATION	SGD			10.06.08

REF. DWGS	TITLE

EQUIP. No.s			
	DESIGN	SGD	JUN-08
	DRAWN	SGD	JUN-08
	ENG CKD.		
	CLIENT APP.		
	SUP APP.		
	SCALE: 1:10,000		SIZE: A3

NORTHPARKES

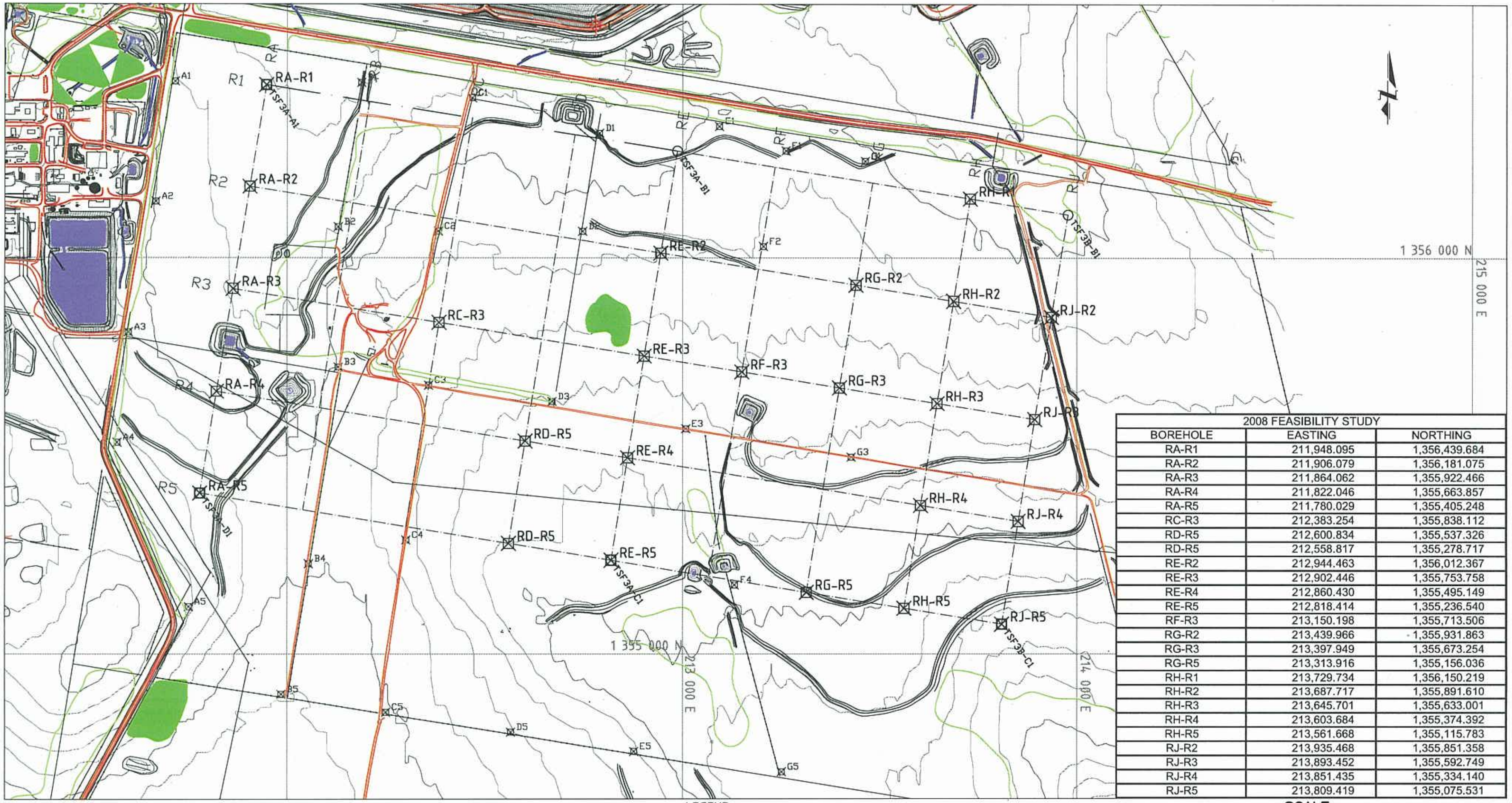
NORTHPARKES MINES
A DIVISION OF NORTH MINING LIMITED (ACN 000 081 434) AS AGENT FOR AND MANAGER OF THE NORTHPARKES JOINT VENTURE.

PLANT AREA 335 - TAILINGS

TITLE TAILINGS STORAGE FACILITY 3 (ESTCOURT)
2008 SITE INVESTIGATION
LOCATION OF BOREHOLES

PROJ/W.O. NO.	AREA	DIS.	NUMBER	REV
	335	9	TBA	A

K:\212A\CAD\PE801-00008_DNN\PE801-00008-004 REV A.DWG



2008 FEASIBILITY STUDY		
BOREHOLE	EASTING	NORTHING
RA-R1	211,948.095	1,356,439.684
RA-R2	211,906.079	1,356,181.075
RA-R3	211,864.062	1,355,922.466
RA-R4	211,822.046	1,355,663.857
RA-R5	211,780.029	1,355,405.248
RC-R3	212,383.254	1,355,838.112
RD-R5	212,600.834	1,355,537.326
RD-R5	212,558.817	1,355,278.717
RE-R2	212,944.463	1,356,012.367
RE-R3	212,902.446	1,355,753.758
RE-R4	212,860.430	1,355,495.149
RE-R5	212,818.414	1,355,236.540
RF-R3	213,150.198	1,355,713.506
RG-R2	213,439.966	1,355,931.863
RG-R3	213,397.949	1,355,673.254
RG-R5	213,313.916	1,355,156.036
RH-R1	213,729.734	1,356,150.219
RH-R2	213,687.717	1,355,891.610
RH-R3	213,645.701	1,355,633.001
RH-R4	213,603.684	1,355,374.392
RH-R5	213,561.668	1,355,115.783
RJ-R2	213,935.468	1,355,851.358
RJ-R3	213,893.452	1,355,592.749
RJ-R4	213,851.435	1,355,334.140
RJ-R5	213,809.419	1,355,075.531

SCALE

200 150 100 50 0 100 200 300 400

METRES

LEGEND:

B2 BOREHOLE DRILLED 2004

RG-R4 PROPOSED BOREHOLE 2008

Knight Piésold
CONSULTING

Knight Piésold Pty Ltd
A.B.N. 67 001 040 419
P O Box 1710, Hornsby, NSW 1635

DWG No.	PE801-00008-003				REF. DWGS	TITLE	EQUIP. No.s	DESIGN	SGD	NOV-04
								DRAWN	SGD	MAY-08
								ENG CKD.		
								CLIENT APP.		
								SUP APP.		
								SCALE: 1:10,000		SIZE: A3
A	ISSUED FOR INFORMATION	SGD		09.06.08						
REV	DESCRIPTION	BY.	CKD.	APP.	DATE.					

PLANT AREA: 335 - TAILINGS

TITLE: TAILINGS STORAGE FACILITY 3 (ROSEDALE) 2008 SITE INVESTIGATION LOCATION OF BOREHOLES

NORTHPARKES MINES
A DIVISION OF NORTH MINING LIMITED (ACN 000 081 434) AS AGENT FOR AND MANAGER OF THE NORTHPARKES JOINT VENTURE.

NORTHPARKES

PROJ/W.O. NO.	AREA	DIS.	NUMBER	REV
	335	9	TBA	A

K:\212A\CAD\PE801-00008_0NN\PE801-00008-003 REV A.DWG

GHD

72 McNamara St, Orange, NSW 2800
PO BOX 950, Orange, NSW 2800
T: (02) 6393 6400 F: (02) 6393 6401 E: oagmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Mees/Waddell/ Metcalfe	D. Chubb	*D Chubb**	Chubb	*D Chubb**	10/12/08
1	Mees/Waddell/ Metcalfe	D. Chubb		D. Chubb		30/01/09
2	Mees	D. Chubb		D. Chubb		31/03/09